University of Alberta

Sport Medical Care for Athletes with Disabilities

by

Joan Matthews White ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Faculty of Physical Education and Recreation

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Dedication

This dissertation is dedicated to my parents, Jerry and Angela Matthews for their endless support, love and assistance. Without them, this would not have been possible, and without them, it would have no meaning.

> To my Parents:
>
> *How do I say thank you for all the love and caring over the years? How do I repay all the nights you stayed up when I was sick, and all the floors you walked when I was late coming home? What can I give you for all the times you supported me in my triumphs, and provided a shoulder when there were losses? What present is there for all the times we just sat together and shared our warmth? How do I thank you for the guidance when I was unsure of my way, and your restraint to allow me to find it myself? You nurtured my growth, yet allowed me my independence. How can I measure the worth of your love? What gift is enough?*
>
> *The answer came to me today. No box can hold it, no wrapping can cover it, nor can a ribbon tie it. No store had it on a shelf. My gift is not to you, it is to my children. I promise to care for them when they are sick, and walk the floors when they are late. I will share with them their victories, and comfort them when there are losses. I will help them to grow, yet let them choose their own path. I'll be there when they need me, and step aside when they must go alone.*
>
> *And someday, maybe, they will come to me and say, "How can we thank you for all you have done for us?" And I will tell them, "Don't thank me. Thank my parents. For I am the product of their love, and you are my greatest gift to them".*
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To Kirby and Guerin.....my greatest gifts.

Abstract

Four studies were conducted to provide descriptive statistical information and qualitative data on the risks of sport-related injuries to athletes participating in disability sport and the management of these injuries. Injury rates were calculated based on athlete-exposures (AE) for alpine skiing (9 injuries/1000 AE), nordic skiing (3.2 injuries/1000 AE) and ice sledge hockey (4.6 injuries/1000 AE) for Paralympic athletes. Wheelchair basketball injury rate was found to be 12.3 injuries/1000 AE with games (17.2 injuries/1000 AE) greater than practices (8.7 injuries/1000 AE). The types and locations of injuries were specific to the sport and the style of participation. Alpine skiers incurred acute injuries to the lower extremity while nordic skiers and ice sledge hockey players reported upper extremity chronic injuries. Wheelchair basketball players reported acute injuries (95%) to the hand, fingers and shoulder. The time-loss from sport participation resulting from musculoskeletal injuries to the hands, fingers and shoulders were minor (< 7 days) to moderate (7 days - 21 days). General medical illnesses and disability-related illnesses (pressure sores, thermal regulation and stump problems) were minor contributors to lost participation.

Athletic performance was the desired outcome for participation. Sport injury management revealed many different ways athletes managed their sport injuries. Athletes did not seek care for 70% of the sports injuries incurred, but instead self-treated their sport injuries. When help was sought, physicians were the primary care givers. Athletes continued to participate in sport with chronic injuries, pain or avoided activities that caused pain. Access to medical care involved external barriers (e.g. available care,

continuity of care, coaches and negative past experiences with the medical community) and internal barriers (e.g. perception of injury, when to access care, negative past experiences, perceived loss of independence and sense of control). To have appropriate conditions for athletes to interact with coaches and sport medical professionals to occur, constraints need to be addressed. Some of the barriers or problems identified within this thesis may not be changed secondary to cost, efficiency and logistics. Other barriers, whether perceived or real, could be affected through education and continued research.

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CHAPTER 1

Theme Introduction

Sports medicine is a field that adopts a holistic, comprehensive, and multi-disciplinary approach to health care for those involved in sporting or recreational activities. Shephard (1992) identifies the field of sports medicine as dealing with all aspects of physical activities that have a medical implication, whether a benefit (therapeutic or training) or a detriment (sports injury). The traditional sports medicine team included the physician, athletic therapist or trainer, and the coach (Arnheim & Prentice, 2000). As issues became more complex, specialists in parallel fields such as epidemiology, nutrition, environmental physiology, sport psychology, biomechanics, or sport equipment designers are making major contributions.

Sports medicine for persons with disabilities is an evolving discipline. While sports medicine has its roots in able-bodied sport, the expectations of excellent athletic training and medical care are no different for the athlete with a disability than the athlete without a disability. The medical care for disability sport can be traced through the rehabilitation model. Initially, sport was used as a valuable tool for therapy, education, and socialization promoted by physicians and physical educators. More recently, athletes with disabilities have embraced sport for the challenge of personal excellence, thrill of competition, and for some elite, a profession.

Following this introductory chapter which includes a brief history and development of sports medicine in disability sports and a review of the existing literature, four studies and final conclusions will be presented with recommendations for future studies and implications for practice.

The Evolution of Sport Medicine for athletes with disabilities - a historical perspective

While sport has value in the lives of everyone, it is as equally important in the life of a person with a disability. Noreau and Shephard (1995) stated that the ultimate goal of exercise and sport has shifted over time from an extension of life expectancy to the attainment of an optimal level of independence and quality of life. It has been demonstrated that sporting activities have significant value for people with disabilities including physical fitness, stabilization of health and social and vocational rehabilitation (Shephard, 1990; Guttmann, 1976). Historically, medical and allied health care professionals focused on the medical needs of individuals with disabilities. This medical model which shaped the views of the community was oriented towards an illness focus. The model was primarily physician-driven, with little involvement of other health care professionals. While there was an appreciation for the role of exercise, the restoration of body function and correction of physical defects and deformities was accomplished solely through the use of remedial exercise or specialized corrective programs. This medical perspective imposed physical restrictions on the individual with a disability and provided the basis for exclusion from sport.

The value of therapeutic exercise and physical medicine was increasingly recognized post war as veterans returned home with physical impairments (Wheeler & Hooley, 1969). At the request of the British government, Sir Ludwig Guttmann, a neurosurgeon at Stoke-

Mandeville Hospital in Aylesbury, England set up the National Spinal Injury Centre for the treatment of soldiers during World War II (WWII). His focus on the rehabilitative needs of this population did much to foster a greater understanding of disability and the humanitarian treatment of persons with disabilities. With his intuitive understanding of rehabilitation and his passion for medical care, he advanced the concept of health for this population. He recognized the value of competitive exercise and sport as a tool for rehabilitation and education, and applied these principles to his patients with disabilities. He utilized an array of professionals in a coordinated multi-disciplinary emphasis to demonstrate the value of sports, games and other forms of recreation for the patient with a spinal injury in maintaining health and personal welfare. He reported that exercise through sport activities improved balance in the wheelchair under various conditions, strengthened muscles faster and improved the condition of the entire body (Guttmann, 1976). In 1948, he organized the first Stoke-Mandeville games, which opened on July 28, 1948 with the participation of 16 WWII veterans. The opening date of the Games was a symbolic gesture and deliberately timed to coincide with the Games of the XIV Olympiad in order to bring attention to sport for persons with disabilities. As his efforts to recognize the athletic abilities of persons with disabilities grew to encompass international competition, Sir Ludwig Guttmann's work became well known. Many credit him with being one of the most instrumental advocates in initiating the development of the disability sport movement.

At the same time, the reactions of persons with disabilities evolved. In early societies, the response was merely acceptance of their fate. It was not until the beginning of the 20th century that different conceptualizations of physical ability evolved. With the incorporation of sport and competitive games into the rehabilitation model, remarkable changes in the external qualities, structure and values of sport for the person with a disability were seen. It became evident that with training and encouragement, the person with a disability could enjoy sport and excel at it. Athletes encouraged technological advances in equipment design and requested more coaching or instruction. These developments resulted in a very high standard of sporting achievement, something formerly considered quite impossible. For some athletes, sport became a "raison d'etre". The demonstration of the transition from rehabilitation into a sport model was evident as physical outcomes became performance-oriented. Injuries to athletes during sports participation impaired their performance and kept them out of competition. As a result, athletes demanded the appropriate medical treatment and care to return to sport participation.

Injury epidemiology: a Sport-specific Perspective

Most research examining the benefit of sport for people with disabilities report physiological gains for those who take part, but relatively few studies have examined sport injury risks. As the sports medicine research is evolving, there is very little knowledge of what sport injuries and conditions exist in disability sport due to a lack of awareness or lack of reporting (Ferrara & Peterson, 2000). Research on sports injuries has only been reported since the early 1980's when Curtis (1981) who defined injury as anything the athlete expressed concern about, first described the types and location of sport injuries for athletes using wheelchairs. Prior to this, the literature cited patient rehabilitation and reintegration into society as the purpose for sport and recreation.

The epidemiology of sports injury research has since expanded to report on the profiles of athletes in disability sport. The questions surrounding the sports medicine requirements for elite athletes with disabilities are unique in that the questions are not only developing at a rapid rate, but provide opportunities in uncharted territory insofar as the scientific community is concerned. An overview of this research is presented chronologically in the following sections for summer and winter sports. Sports injury research for summer sports, specifically the athlete using a wheelchair, has relatively more published articles than any other disability sport. Conversely, the research and injury profiles for athletes in winter sports are sparse but developing.

Summer sports

Earlier research projects by Curtis & Dillon (1985) and Ferrara & Davis (1990) utilized recall surveys to study injuries to American athletes using wheelchairs. Curtis & Dillon (1985) reported a consistent pattern of injuries among the high-risk repetitive sports such as wheelchair track, basketball and road racing. Soft tissue injuries, blisters, skin abrasions and lacerations of the upper extremity were associated with increased sport participation and a high number of training hours per week. As well as the sport-related injuries, other main concerns among road racers were disability-related problems such as autonomic dysreflexia, temperature regulation and bladder and bowel problems (Martinez, 1989). In the study by Ferrara & Davis (1990), strains and muscular injuries accounted for almost half of the injuries, with the shoulder as the most frequently injured area. Further, a high percentage (32%) of the injuries sustained by athletes using wheelchairs were severe enough to cause the athlete to be away from sport for more than 3 weeks. These authors recognized that there was a set of particular risk elements involved for athletes with disabilities in sport such as lack of flexibility and weight training or dramatic changes in intensity of training. Hoeberigs and colleagues (1990) increased the awareness of young athletes with disabilities in wheelchair basketball as a high risk group for injury based on the nature of their disability and the resultant vulnerability to environmental conditions. He examined the impact of an athletic injury (physical, psychological and social) and reported that athletes with disabilities define sports injury differently than able-bodied athlete in that the injury may be related to the disability. McCormack and colleagues (1991) studied the injury profiles by a recall questionnaire of 90 Canadian athletes using wheelchairs. They found that 146 injuries were reported in 18 different sports, with less than one-third of all athletes seeking medical assistance for their sport injuries. This study concluded that sports participation and competition for athletes with disabilities were not without risk.

A study on the injury profiles of Canadian athletes at the VIII Paralympic Summer Games Seoul 1988, by Burnham, Newell and Steadward (1991) suggested that both the type of sport and type of disability were factors in injury location. The authors recorded 82% of the athletes received medical attention with the majority of injuries classified as chronic, or injuries which developed prior to these Games. For example, shoulder pain was a common complaint for athletes using wheelchairs, lower extremity injuries were frequently reported by athletes who are blind, and athletes with cerebral palsy were predisposed to low back strain.

A year later, Ferrara, Buckley, McCann, Limbird, Powell and Robl (1992) surveyed

426 athletes at a national competition in the United States to report that 32% incurred at least one injury during a 6 month study period. Injuries were categorized by specific athletic organizations, with 37.1% of the total injuries reported from the Association for Blind Athletes, 37.1 % from the Cerebral Palsy Athletic Association, and 25.8% from the National Wheelchair Association. Eighty-seven percent of the total number of injuries occurred to the upper and lower extremities. Overall, the shoulder was the most affected, followed by the leg, ankle and knee. The athletes using wheelchairs had the greatest proportion of shoulder injuries. Athletes in the associations of cerebral palsy and blind had the greatest percentage of knee and ankle injuries as a result of ambulatory participation style.

The first study on children with disabilities in competitive disability sport was conducted by Wilson and Washington (1993). While only 34% responded to the survey, a significant number of injuries were reported by those participating in track (97%) and swimming (91%). A wide variety of injuries were reported ranging from soft-tissue injuries such as blisters to disability-specific conditions such as thermo-regulation or pressure sores. Using this information, the authors suspected that children may be more susceptible to certain types of injuries during different phases of their growth and development. This study increased an awareness to the general issue of pediatric sport injuries confounded with disability. These injuries which may reflect overuse syndromes and should be monitored closely to prevent the development of chronic problems.

Burnham, Higgins and Steadward (1994) studied the types and severity of injuries sustained by 116 Canadian basketball players using a wheelchair, which was estimated to be 65% of the national players. Eighty-two percent of the athletes reported at least one time-loss injury during the study year. The hand was the most common site injured, but injuries to the shoulder, elbow and wrist were more significant in terms of time loss from participation. These significant injuries were associated with an increase in the number of training days per week, multi-sport involvement, and increased weight training.

Baseline information on injury occurrence in amputees playing soccer was documented by Kegel and Malchow (1994). This preliminary study showed that injuries were minor, sustained to the knee, ankle, face and shoulder, similar to those reported for able-bodied soccer players. While the sport of soccer was identified as low injury risk, more extensive record keeping over a longer period is important to confirm these results.

Ferrara and Buckley (1996) conducted the first prospective study to determine the risk of injury during sports participation. The Athletes with Disabilities Injury Registry was a cross-disability epidemiological project designed for 3 years which followed 319 athletes. An overall injury rate of 9.45 / 1,000 athlete-exposures was reported. An increased time-loss from athletic activity for injuries involving the shoulder, hands and fingers were observed in the study, with loss of participation times significantly longer than athletes without a disability. The researchers concluded that these findings necessitated further research to determine why the time-loss factor is greater for athletes with disabilities, and re-iterated the importance of continual monitoring of injury patterns and the effectiveness of any injury prevention measures that are instituted. It has been hypothesized that reasons for the major time loss in participation may be due to the delayed healing process of the athlete with a spinal cord injury, a conservative treatment approach, as well as athletes who are self-treating their injuries and not seeking assistance (Ferrara & Davis, 1990). A low utilization or use of the medical professionals post-injury has also been frequently reported. Authors have speculated that possible reasons may include a loss of independence by seeking help, fear of being told to stop their activities, previous negative experiences during treatment, or a lack of understanding by the medical professionals of both the athlete's sport and disability (Burnham, Curtis and Reid, 1995).

Shoulder pain in female wheelchair basketball players was assessed by Curtis and Black (1999). The results indicated that over 70% of wheelchair basketball players have experienced should pain since beginning wheelchair use. Greater intensity of shoulder pain was reported to be higher with daily activities than with variables associated with sports participation. In a prevention effort, the first published efficacy study on the effect of a standard exercise protocol on shoulder pain was conducted (Curtis, Tyner, Zachary, Lentell, Brink, Didyk, Gean, Hall, Hooper, Klos, Lesina & Pacillas, 1999). Subjects in this study who performed strengthening exercises for postural changes and related muscular imbalance decreased the intensity of shoulder pain in their functional daily activity.

Ferrara, Palutsis, Snouse and Davis (2000) conducted a longitudinal study of injuries to athletes with disabilities from 1990-1996. Injury data was collected by United States medical staff during specified multi-disability competitions. Illnesses were the most commonly reported problem followed by muscular strains of the thorax/spine, shoulder and hip/thigh. Of interest was the number of reported injuries which were acute episodes, different than reported by other authors which have found a 50-50 ration of acute to chronic injuries. These authors theorized that due to the nature of the competitive events and sport activities acute trauma would be more prevalent.

Winter sports

With regard to winter sport injuries, the research available is recent and sparse. Only a few articles have described sport injuries for athletes in winter activities. In 1983, McCormick (1985a) surveyed 68 skiers at a regional U.S. skiing championship to report injury rates on estimating exposure. The results indicated that 70% of the skiers had never been injured while skiing. Of the 23 reported injuries, the knee was the most commonly injured body part. An overall injury rate of 2 injuries per 1,000 skier-days was calculated, which is an injury rate within the same range as that for the able-bodied population (Jaffin, 1981; Johnson, Pope & Ettlinger, 1976)). Two years later, the same author (McCormick, 1985b) surveyed 23 racers using a sit-ski to report if they have ever been injured while skiing. The incidence of injuries was estimated to be 16.1 injuries per 1,000 skier days. This injury rate was eight times higher than the rate for the skier with a disability who does not use the sit-ski. Also, the skier's type of disability appeared to be related to the likelihood of injury. Skiers with a high lesion spinal cord injury (above thoracic level 8) incurred more injuries than those with a low spinal cord injury (below thoracic level 8). The authors did not speculate on the reasons for this finding. According to a United States study by Laskowski and Murtaugh (1992), the data from skiers with disabilities gathered from instructional programs at multiple sites suggested that the skier with a disability is at no greater risk of injury, both in terms of actual incidence rate and severity, than the able-bodied skier. They concluded that the learning or non-competitive skier with a disability is at less risk for serious injury and more likely to sustain only minor bruises. Major sports injuries, such as fractures or trauma leading to further permanent disability were rare.

The identification of a training and injury profile for the elite winter-sport athlete is derived from only one study. Ferrara and colleagues (1992) investigated the injury experience of the competitive skier with a disability by administering a retrospective survey in 1989 to 68 U.S. national skiers. They found the number of chronic injuries was greater than the number of acute injuries and that the upper and lower extremities accounted for most of the injuries. Injuries involving the shoulder and knee were frequently reported. They also reported similar findings as McCormick (1985b) that there was an increase in injury in skiers with a spinal cord injury above the sixth thoracic level. It was identified that only 40% of those reporting an injury sought medical treatment, which was deemed unacceptable by the authors for this level of sport participation.

Research Questions

As documented above, the information examining the extent of the injury problems and injury prevention strategies associated with the athlete with a disability is derived from few research studies. There is a need to further explore the sport injury experience and medical needs of the athlete with a disability. Sport has gained acceptance as a safe and effective activity for athletes with disabilities. However, before high performance level sport can be classified as such, further studies are required to ensure that this form of training does not result in harmful or injurious activity. This involves a thorough understanding of the athlete, the environment, the sport equipment, the sport-specific injuries and the disability-related conditions. Epidemiological sports medicine research is critical to understanding sports injuries and risk of injury. In fact, Noyes and Albright (1988) promote the notion that all sports medicine research should be approached epidemiologically from the outset in order to gain an understanding of the subject (i.e., sports injury). The efficiency of examining sport-related injury frequency data using standard epidemiological techniques have been previously established among the able-bodied literature (Noyes & Albright, 1988; Clarke, 1976).

Presently, epidemiological research is limited in the area of disability sport. Up until the last 5 years, research in the area has been primarily descriptive. Most of the data on sports injuries among this population have been gathered from cross-sectional surveys utilizing retrospective data. Here all members of a given athlete group were identified, and their current (and prior) injury experience was ascertained, in combination with risk factor information (Curtis & Dillon 1985; Ferrara, Buckley, McCann, Limbird, Powell, & Robl 1992; Ferrara, & Davis 1990; McCormick 1985a, 1985b). While this research is useful to increase awareness and in the ability to generate research hypotheses worthy of testing, research identifying sport injury risks associated with participation in specific sports, is what gives the basis for these following studies.

Previous studies have concluded that there is opportunity for injury during participation, that there is a significant time-loss from activity, and that sports injuries are not always medically evaluated. Therefore, the purpose of this dissertation was to identify the risks of sport-related injuries to athletes participating and training in disability sport and post-injury management. The objective of this thesis is to attempt:

1. To determine the risk of injury during participation in specific disability sports (ie., ice sledge hockey and wheelchair basketball);

2. To determine the time-loss from participation in sport resulting from sport injury;

3. To determine the injury management of sports injuries for the athlete with a disability.

Paper Format (Project Evolution)

This dissertation is comprised of four studies related to athletes with disabilities; their training, sport injury experiences, and medical care. The theoretical development of these papers evolved by tracing the path of the Paralympic Movement, as the interaction of the athlete with a disability with the medical community shifted from a rehabilitation model to a sport model.

The first study, entitled Training History and Sports Injury Profiles of Athletes with a disability from the VI Winter Paralympic Games, Lillehammer, Norway, 1994, is reported in Chapter 2. The purpose of this study was to examine the training and sport-specific injuries of elite athletes participating in alpine skiing, nordic skiing and ice sledge hockey. This preliminary study utilized various groups of athletes to help illustrate the types of disabilities that are increasingly being represented in this setting and the specific injuries resulting from participation in disability sport.

The second study, The Training History and Sport Injury Experience in Canadian Sledge Hockey Players is reported in Chapter 3. Ice sledge hockey players documented retrospectively, their sport-specific training and sport injuries incurred during participation for one season.

The third study, A Prospective Study of Sport Injuries in Canadian Womens Wheelchair Basketball utilized a sport injury recording system for athletes involved in wheelchair basketball to examine sport participation, injury and treatment epidemiologically. Participants documented their exposures (games and practices) to wheelchair basketball and any sport injuries as they happened.

The fourth and final study is reported in Chapter 5, entitled the Sport Medicine Care - An Athletes' Perspective. A questionnaire was developed to address the athletes' interaction with health care. Utilizing a qualitative methodology, the purpose of this study was to explore issues surrounding the medical care of injured athletes with disabilities.

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CHAPTER 2

Training History and Sports Injury Profiles of Athletes with disabilities from the VI Paralympic Winter Games, Lillehammer, Norway, 1994

> I know my capabilities and accept the limitations.
> I don't accept those in society imposing more limitations because I am labeled disabled.
> I am different-abled
>
> 1994 Paralympian athlete
> Lillehammer, Norway

Introduction

Over the past 20 years, the sports movement for athletes with disabilities has reached a professional level. The increased popularity of winter disability sports can be measured by the growth of the Paralympic Games (Laskowski & Murtaugh, 1992; Doll-Tepper, 1992). The Winter Paralympic Games are the pinnacle of competitive events for athletes held every four years on the same cycle as the Olympic Games, where the best athletes from around the world meet to compete at the highest level possible. The Winter Paralympic Games have a fairly short, but distinguished history. The first winter Games took place in 1976 in Sweden which included athletes from 12 countries competing in alpine and cross-country skiing events. Sixteen years later, 24 countries participated in the 1992 Paralympic Games in Tignes, France. The VI Paralympic Winter Games Lillehammer, 1994, was the largest ever with 600 competitors from 31 countries. These Games also marked the entry of new medal events which included ice sledge hockey and ice sledge racing.

With this increase in participation at the Winter Games, a higher level of competition and athletic excellence followed. In addition, availability of adapted training facilities and advances in technology, design and production of adapted equipment have resulted in improved performances (Abood, 1990; McCormick, 1985a; McCormick, 1985b). It has been documented that with the increase in participants, sports-related injuries have increased (Ferrara, Buckley, Messner, & Benedict, 1992; Laskowski & Murtaugh, 1992; McCormick, 1985a; McCormick, 1985b). However, there are only a few studies that have described injury profiles of winter athletes with disabilities. Studies by McCormick (1985a;1985b) and Laskowski and Murtaugh (1992) focused on the recreational skier, while the only published study to examine the training and injury profiles of the competitive skier with a disability was conducted by Ferrara and colleagues in 1992.

The purpose of this paper was to identify the training and sport injury profiles of winter Paralympian athletes. Retrospective data were collected describing the training routines and the sports injury experiences on competitors in alpine, nordic and ice sledge hockey events for the six months preparatory period prior to the VI Paralympic Winter Games in Lillehammer, Norway, in 1994.

Methodology

Description of the Subjects

The subjects of this study were 45 national team athletes from Canada and United States who participated at the Paralympic Winter Games in Lillehammer during the period of March 6 - 20, 1994. Athletes from this sample participated in one of three events:alpine skiing, nordic (cross-country) skiing or ice sledge hockey. Prior to the Paralympic Games, an introductory letter was sent to the American and Canadian medical staffs to introduce the project, who gave their full support. Medical staffs and athletes were also informed that the research project was supported by the International Paralympic Committee and approved by the Faculty of Physical Education and Recreation Research Ethics Committee at the University of Alberta, Canada.

Data Collectior

Questionnaire

A questionnaire was devised to gather athlete demographic information, retrospective data on training, and injury information related to sports participation for a 6-month period. Questionnaire design was provided by experts in the area and pilot tested at the Rick Hansen Centre (N=10), Edmonton, Canada to validate the use of a single standardized instrument across different disability groups and different sports. The format was a combination of closed-ended, multiple-response items and short narratives in the three sections of demographics, sport training, and injury experience (Appendix A: Paralympic Athlete Questionnaire). Injury was defined as: *any sport-related or disability-related trauma that occurred in the past 6 months during any practice, training, or competition session that resulted in medical care OR stopping or modifying the athlete's participation for at least 24 hours.*

Administration of the questionnaire

Structured interviews occurred at the Games, at a time appropriate for each athlete.

Sixty-two athletes were approached to participate in the study. Each athlete was given an explanation of the purpose of the study, made aware of the voluntary nature of his/her participation and was assured of confidentiality. Participants were asked to sign the consent form (Appendix B: Consent Form). The principal investigator administered the questionnaire by individually scheduled interviews to all consenting Canadian and American Paralympic athletes. All surveys were determined to be complete by the researcher and included for analysis.

Data Analyses

Analysis involved simple frequency counts and percentages of the data on athlete demographics, training frequency, and the type and frequency of injuries. Analysis of variance was used to test for group differences in age, sex, years of disability, and years in sport among the sports of alpine, nordic and ice sledge hockey, at a significance level of $\alpha=0.05$. Independent variables (sex, age, sport, disability, years of disability, years of sport participation, sport classification, coach and training volume per month) were examined for possible relationships to the dependent variable (injury) using bivariate logistical regression. Those variables that presented a p-value less than or equal to 0.10 were then entered into a multiple regression model.

Results

Athlete demographic profile

Forty-five of the 62 Canadian and American athletes at the Games volunteered to participate in this study, providing a response rate of 73%. The 45 athletes, 35 men and 10 women represented winter events which included alpine skiing, nordic skiing and ice sledge hockey. Fifty-three percent (N=24) of the respondents participated in alpine events, 26% (N=12) in nordic events, and 20% (N=9) in ice sledge hockey. Table 2-1 identifies the mean and standard deviation of the participants' age, years since onset of disability, years of sport participation and the type of disability across sport and sex. Overall, 32.3 years was the average age of the participants within an age range of 14 - 45 years (SD=7.8). There was a significant difference in the ages of the athletes between sports ($p<0.05$) with the sledge hockey athletes being significantly older than the alpine athletes. The average number of years of onset of disability for all athletes was 17.3 years (SD=10.6). Using ANOVA, ice sledge hockey athletes were disabled for a significantly longer time than the alpine athletes ($p<0.05$). No significant differences were found for the number of years of participation between athletes among the 3 sports. Overall, females in alpine and nordic events were younger, had been disabled for a longer period of time and had more experience in nordic skiing events than the males in the sample, but not to a statistically significant level. Eighty-seven percent (N=39) of the participants had acquired their disability. Those who acquired their disability included athletes with an amputation (N=18), spinal cord injury (N=14), polio (N=3), visually impairment (N=2), and upper extremity paralysis by unknown cause (N=2). Seventy-four percent of the athletes who acquired their disability reported being involved in sport prior to any impairments. The remaining 13% (N=6) of the athletes reported their disability as congenital, comprising of birth deformity (N=3), visual impairment (N=2), and spina bifida (N=1) as causes.

Table 2-1: Participant demographics for age, years of onset of disability, and type of disability by sport and sex (mean and standard deviation)

SPORT	ATHLETE	N	AGE Years Mean (SD)	YEARS OF DISABILITY Mean (SD)	YEARS IN DISABILITY SPORT Mean (SD)	TYPE OF DISABILITY	
						Acquired	Congenital
ALPINE	Males	1862	29.9 (7.9)	12.6 (6.1)	6.8 (3.2)	16622	202
	Females	4	26.2 (7.2)	12.8 (10.7)	6.8 (4.2)		
	Athletes		29.0 (7.8)	12.6 (7.3)	6.8 (3.4)		
NORDIC	Males	8412	35.3 (6.0)	16.8 (10.1)	4.9 (3.4)	639	213
	Females		33.8 (7.4)	24.0 (11.3)	9.0 (6.5)		
	Athletes		34.8 (6.2)	19.2 (10.6)	6.3 (4.8)		
SLEDGE HOCKEY	Males	9	37.7 (6.2)	27.1 (11.4)	5.6 (2.0)	8	1
TOTAL	Males	3510	33.1 (7.7)	17.3 (10.4)	6.0 (3.0)	30939	516
	Females	45	29.2 (7.9)	17.3 (11.8)	7.7 (5.0)		
	Athletes		32.3 (7.8)	17.3 (10.6)	6.4 (3.6)		

The Paralympic events classify each athlete according to ability. Each athlete competes in a specific class with other athletes of similar visual or physical ability. For purposes of this study, and in response to this classification system, athletes were classified by the style of participation or body position during sport participation. With the use of adaptive equipment, athletes participated generally by standing or sitting and were categorized as such (Doll-Tepper, 1992). Athletes with such disabilities as upper extremity amputations, visual impairments or limb paralysis comprised the 24 athletes in the *disability standing* class. Twenty-one athletes with polio, spina bifida, spinal cord injury or lower limb amputations were categorized in the *disability sitting* class.

Athlete Training Profile

In preparation for these games, athletes began training an average of 6.4 years (SD=3.6) prior to the Games in March of 1994. In the past six months, 70% of the alpine skiers and 78% of the ice sledge hockey athletes reported training with a qualified coach, whereas only 27% of the nordic skiers reported coaching assistance.

The training frequencies by sport, in mean number of sessions per week, and mean number of weeks per month for each of the six months is reported in Table 2-2. Training frequencies for alpine and nordic participants showed monthly differences with an increase in the number of weeks and days of training from September to January, and then plateauing in February. Ice sledge hockey training remained consistent for the entire six months, but at a greater frequency than the alpine and nordic athletes. The overall mean for a training session duration for alpine athletes was 5.1 hours (SD=1.2) per session, 1.7 hours (SD=0.7)

Table 2-2: The mean scores and standard deviations of the number of weeks per month, days per week, and mean length of practice sessions per sport - (A) alpine, (B) nordic and (C) sledge hockey athletes

(A): Alpine Skiers

Sport	Month	Weeks/month training mean (SD)	Days/week training mean (SD)
Alpine	September	2.3 (1.9)	2.7 (2.4)
	October	2.5 (1.8)	3.1 (2.3)
	November	3.5 (0.9)	4.3 (1.5)
	December	3.6 (1.0)	4.5 (1.6)
	January	3.8 (0.5)	5.3 (0.8)
	February	3.8 (0.9)	4.8 (1.5)
	Overall mean 6 months	3.2 (1.4)	4.1 (1.9)

(B): Nordic Skiers

Sport	Month	Weeks / month training mean (SD)	Days / month training mean (SD)
Nordic	September	2.6 (1.8)	4.5 (2.7)
	October	2.8 (1.5)	4.8 (2.4)
	November	3.6 (0.8)	5.8 (1.0)
	December	3.5 (0.7)	5.8 (1.0)
	January	3.5 (1.1)	5.5 (1.8)
	February	3.5 (1.2)	5.7 (1.8)
	Overall mean 6 months	3.3 (1.3)	5.3 (1.9)

(C): Ice Sledge Hockey players

Sport	Month	Weeks / month training mean (SD)	Days / week training mean (SD)
Ice sledge hockey	September	3.8 (0.3)	3.7 (1.9)
	October	4 (0)	4.2 (1.9)
	November	4 (0)	4.1 (2.0)
	December	3.9 (0.3)	4.2 (1.9)
	January	4 (0)	4.2 (1.9)
	February	4 (0)	4.2 (1.9)
	Overall mean 6 months	3.9 (0.2)	4.1 (1.8)

per session for nordic training, and 1.6 hours (SD=0.7) for an ice sledge hockey session. Ninety-eight percent (N=44) of the athletes reported performing either a general or specific warm-up prior to a training session or competition while only 48.9% (N=22) reported doing a cool-down at the end of each session. In addition to training during this 6 month period, athletes competed in their respective events. During the 6 month period, ice sledge hockey athletes competed on average in 1.33 tournaments (SD=0.7), alpine athletes entered an average of 2.79 races (SD=2.5), and nordic athletes averaged 2.5 events (SD=2.9).

The specific training methods reported by the athletes included weight training, flexibility and cardiovascular training including aerobic and anaerobic activities for the reported 6 month period. In the data reported by the alpine athletes (Figure 2-1), a tapering effect was shown three months prior to the games in all activities, with flexibility training consistently higher in frequency and anaerobic training consistently lower. The profile of nordic athletes (Figure 2-2) revealed aerobic training as the most frequent activity for the entire 6 month period. The frequency of flexibility, aerobic and anaerobic training progressively increased during the last three months prior to the games, while weight training frequency progressively decreased. Per month, the ice sledge hockey athletes trained far less frequently in all activities compared to the athletes in the other 2 sports. Training, depicted in Figure 2-3, showed minimal variations in the frequency of activities practiced, with anaerobic activities being the least practiced.

Sports Injury Profile

Twenty-six injury report forms were completed by 58% of the subjects (male=20; female=6).

Figure 2-1: Training activities for Alpine

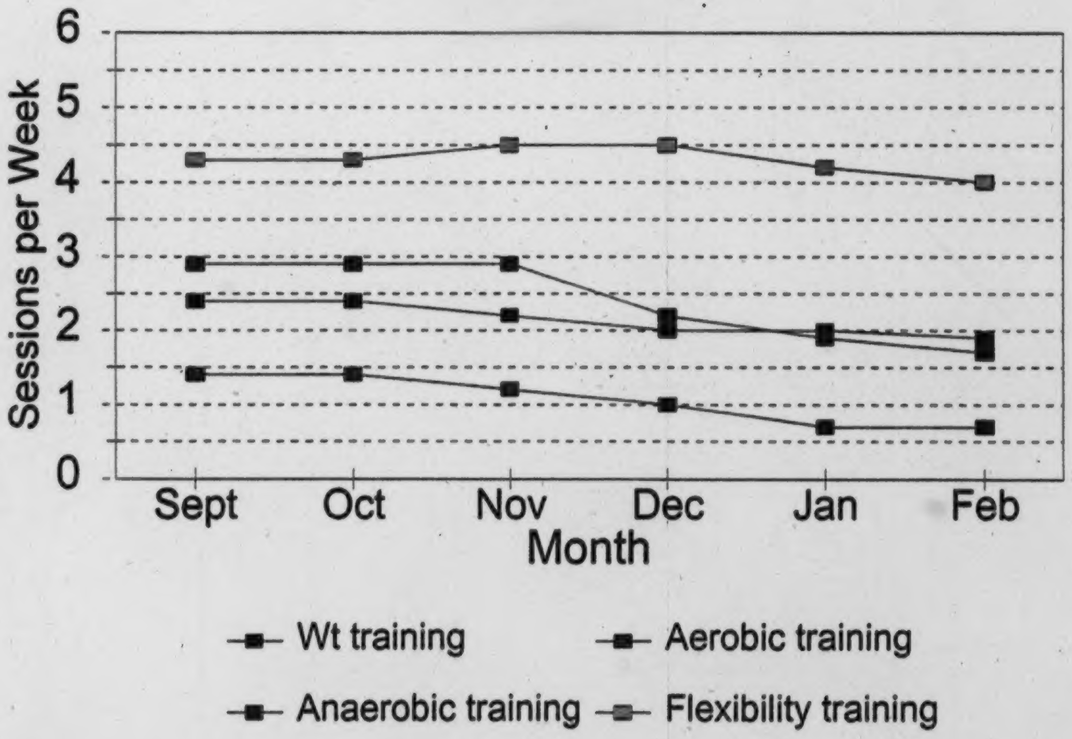


Figure 2-2: Training activities for Nordic

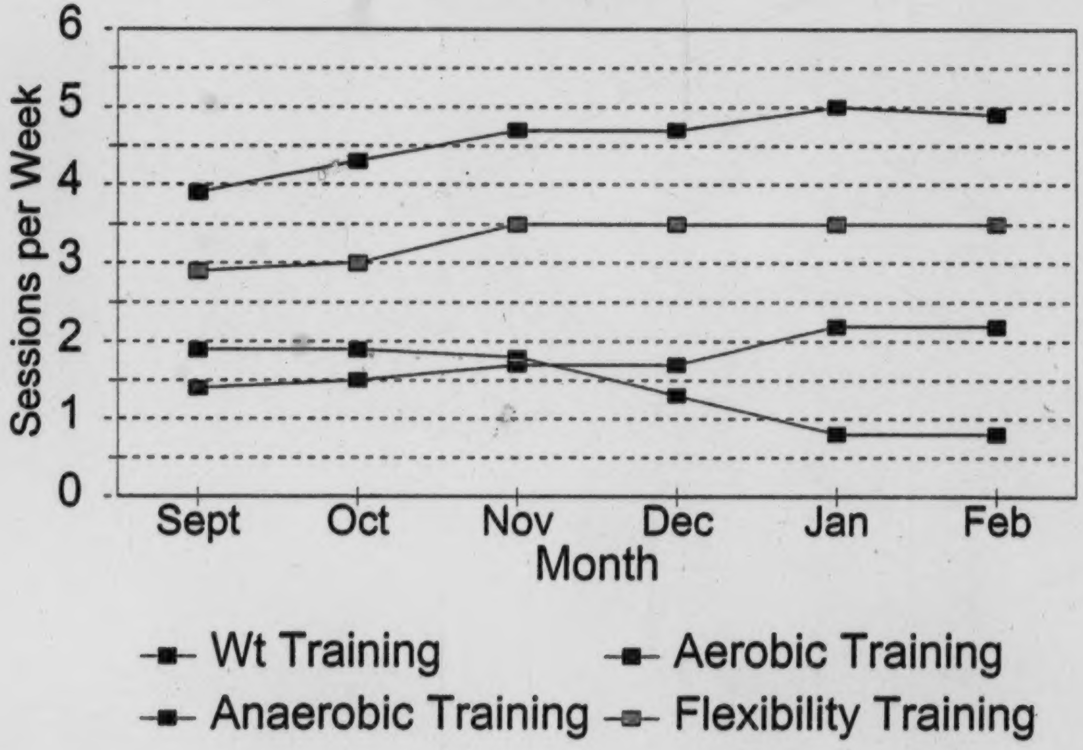
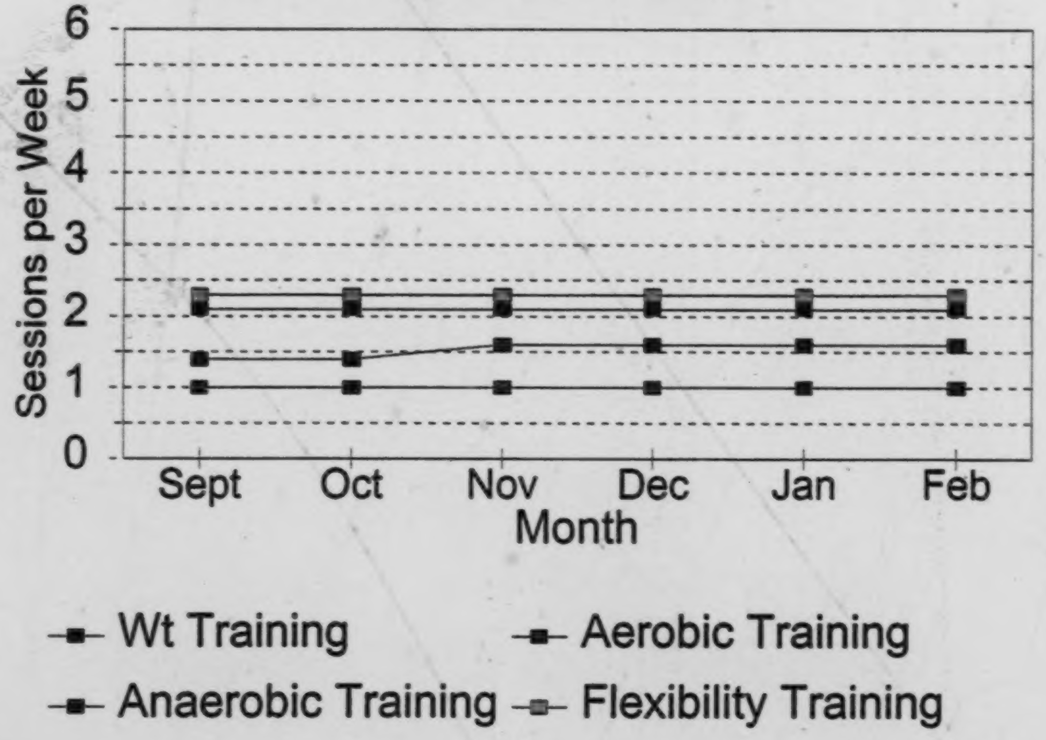


Figure 2-3: Training activities for Ice Sledge hockey athletes



Sports injuries were reported from 75% (N=18) of the alpine skiers, 33.3% (N=4) of the nordic skiers, and 44.4% (N=4) of the ice sledge hockey players. Using the retrospective training data, injury rates per 1000 exposures were calculated for each sport. The highest injury rate was calculated for alpine athletes reporting 9 injuries per 1000-skier days. Relatively, both nordic and ice sledge hockey athletes revealed lower injury rates of 3.2 injuries per 1000 skier-days and 4.6 injuries per 1000 ice sledge hockey-days respectively.

Regression models were used to determine predictors of sports injury. The two variables of sport type (P=0.04, Odds Ratio=4.84)) and years of disability (P=0.02, Odds Ratio=0.67) were the only independent variables that reached significance using bivariate logistic regression. The remaining factors (sex, age, type of disability, years of disability, years of sport participation, sport classification, coach and training volume per month) were not statistically significant ($P > 0.05$). The multivariate regression model was not statistically significant (0.064).

The frequency of injury locations by sport is outlined in Table 2-3. Generally for all sports, the upper extremity received the same number of injuries (N=11) as the lower extremity, followed by spine (N=3), face (N=1) and trunk (N=1). Per sport, injuries to the lower extremity were reported only by alpine athletes, comprising more than 3 times the number of injuries to the upper extremity among this group. In contrast, nordic and ice sledge hockey athletes reported only upper extremity injuries. Overall, the number of acute injuries was slightly higher than the reported number of chronic injuries. Fifty-six percent (N=15) of the injuries were acute, defined as injuries that occurred for the first time, which was slightly higher than the 12 chronic injuries (44.4%), defined as injuries which developed

Table 2-3: Frequency of acute and chronic injuries by body part

SPORT	ACUTE	CHRONIC	TOTAL
Alpine			
Upper extremity	19210	22101	**311311**
Lower extremity			
Spine			
Face			
Trunk			
Nordic			
Upper extremity	1	3	**4**
Sledge hockey			
Upper extremity	1	3	**4**
TOTAL	**15**	**12**	**27**

over time or reoccurring injuries. By sport, alpine athletes reported twice the number of acute injuries compared to chronic injuries, which was opposite for the nordic and ice sledge athletes.

The profile of the injury locations varied per sport (Figure 2-4). Alpine skiers reported the thigh and knee as the most frequently injured body parts, often the result of falls, equipment contact, the breakdown of prosthesis while skiing or skin breakdown due to the prosthesis. Nordic and ice sledge hockey athletes listed chronic shoulder injuries as the most frequently injured site.

By grouping the athletes in the previously described classification system, 50% of the athletes in the *disability standing* class and 67% of the athletes in the *disability sitting* class completed injury forms. The injury rate for *disability sitting* group at 7.3 injuries per 1000 athlete-exposures was higher than the *disability standing* group, with a rate of 5.9 injuries per 1000 athlete-exposures. Injury locations by sport classification is shown in Table 2-4. Ninety-two percent of the upper extremity injuries were incurred by athletes in the *disability sitting* group, with the majority of these injuries (75%) classified as chronic. Except for one lower extremity injury reported by an athlete in the *disability sitting* group, 90% of the lower extremity injuries were incurred by athletes in the *disability standing* group, which were primarily acute in nature. Per disability, 93% of the athletes with a spinal cord injury reported an injury (N=13), followed by 44% of the athletes with an amputation (N=8).

Of the 26 injuries reported, 73% (N=19) of the athletes sought medical care for their sport injury. Ninety-three percent of the acute injuries were medically evaluated whereas only 50% of the chronic injuries were medically evaluated. When the athlete did seek

Figure 2-4: Percentage of injuries by body part per sport.

Alpine Injuries

Face - 5.3%
Spine - 15.7%
Shoulder - 10.5%
Wrist - 5.3%
Pelvis and hip - 10.5%
Thigh and knee - 36.8%
Leg and ankle - 15.8%

Nordic Injuries

Shoulder - 50%
Elbow - 50%

Ice sledge hockey Injuries

Shoulder - 50%
Arm - 25%
Wrist - 25%

Table 2-4: Area of the body injured by sport classification

LOCATION SPORT	ACUTE	CHRONIC	TOTAL
Disability Standing			
Upper extremity	1721	200	1921
Lower extremity			
Spine			
Face			
Total	**11**	**2**	**13**
Disability Sitting			
Upper extremity	2100	9011	11111
Lower extremity			
Spine			
Trunk			
Total	**3**	**11**	**14**

medical care, physicians were reported as the most common medical care provider in a clinic or hospital setting (58%), followed by other health care providers such as physical therapists (26.9%) and chiropractors (7.6%). Twenty-seven percent (N=7) of the injured athletes that did not seek medical attention reported to self-treat their sport injuries. Of those injuries that were self-treated, 86% (N=6) were categorized as chronic injuries.

Athletes were asked to report on injury prevention information received in preparation for the games. Sixty-seven percent (N=30) of the athletes reported to have received information on injury prevention within the last 6 months, with 75% of the athletes requesting more information relating specifically to their particular sport, equipment, training and conditioning, sport psychology, and their disability in sport participation. Also, future information was requested to be specific for the disability, such as braille for athletes with visual impairments, or specific to their native language, such as French.

Disability-related problems to sports participation

Fifty percent of all the athletes reported some type of disability-related trauma which affected sport participation. Seven of the 21 athletes in the *disability sitting* group (33%) recorded pressure sores of the buttocks due to transfers from the wheelchair to the mono-ski and the shear-type movements that occurred during participation. Five of the 24 athletes in the *disability standing* group reported pressure sores and stump problems with their prosthetic device. Twenty-seven percent of all the athletes (N=12) recorded thermal regulation as a problem in sport participation, as hypothermia or frostbite can be expected in winter climates. Hypothermia and frostbite were reported more frequently by athletes in *disability* *standing* (33%) than athletes classified in *disability sitting* (19%). Athletes identified the lower extremity as the primary location for cold-related problems. Possible speculation on the mechansims or reason behind such reported difference in the two groups may be the conservation of heat in the seated position versus great exposure to heat loss in the standing position.

Due to the high prevalence of medications and supplements in disability sport (Peck & McKeag, 1994; Ferrara et. al., 1992), athletes were asked to report their use of medications and nutritional supplements during the last six months. Uses of prescribed medications were reported by 42% of all athletes. Twenty-seven athletes (60%) reported the use of nutritional supplements such as vitamins, mineral and protein supplement for performance enhancement purposes.

Limitations

It is possible that an under reporting of injuries may have resulted. Only those athletes that attended the games participated in the project, thus eliminating any athletes who unable to attend the competition due to injury. Although one could speculate that only non-injured athletes attend the games, the data shows that this may be incorrect, and that injured athletes are still competing. Further, to profile a major games was such that athletes may not remember or accurately report an injury, downplayed the severity of the injury, or did not want to report it which results in underestimating injury rates.

Discussion

There is no widely used definition of what constitutes a sport injury. Most studies define injury by time lost, medical treatment required or anatomical tissue diagnosis (Noyes, Lindenfeld & Marshall, 1988). Defining an injury by the amount of time lost from participation has been the most common and easiest definition to use. Whereas minor injuries are to be expected in sport, reporting time-loss injuries gives priority to the injury that is not minor. This study defined sport injury by time loss from participation for at least 24 hours, or if medical care was sought. This definition of injury was used for 2 reasons. First, to assess the rate of injuries other than minor injuries, and second, to utilize the same definition to present a meaningful comparison in the only other study on the competitive winter athlete with a disability (Ferrara et al., 1992).

In the current study, 26 time-loss injuries were reported during the 6 months preceding the Games from 45 athletes. Ferrara & colleagues (1992) reported a 100 time-loss injuries during a 6 month period from 68 U.S.A. skiers at a National Championship. Although the study periods were of the same duration and the demographic profiles (age, years of disability, years in sport, type of disability) of the athletes were similar, there are possible explanations for the decrease in the number of reported injuries in this study compared to the study by Ferrara and colleagues (1992). In this study, the sample size was smaller. Another reason may possibly be a result of a selection bias. Injury rates may depend on a skier's ability and whether he or she competes at an elite level (Johnson, Ettlinger & Shealy, 1989). Athletes in attendance at a regional or national competitions may be injured more frequently than advanced or more skilled athletes at an international or

Paralympic level of competition. Also, athletes in this study demonstrated a higher frequency of training compared to data reported by athletes in the 1992 study. More training could possibly improve their physical conditioning and thereby reduce the frequency of injury. Finally, the difference in the number of injury reports may be a result of the type of sports that the athletes participated in. In Ferrara and colleague's study (1992), all subjects participated in alpine skiing. This study surveyed athletes in 3 sports, with slightly more than 50% of the subjects identified as alpine skiers. The results of this study indicated that more injuries were reported by alpine skiers than nordic skiers and ice sledge hockey athletes combined , thus lowering the overall number of injury reports than if all the subjects participated in a higher risk sport such as alpine skiing. If injury reports solely for the sport of alpine are examined, the number of injuries per skier are similar. In this study, 24 alpine skiers reported 18 injuries, or almost 1 injury per skier. Athletes in Ferrara and colleague's (1992) study reported 1.5 injuries per skier.

Injury trends followed the type of activity that athletes participated in. According to the calculated injury rates in this study, athletes participating in alpine skiing were at a greater risk for injury than were nordic skiers or ice sledge hockey athletes. Alpine skiers were associated with a 4-fold increase in the rate of injury. Alpine skiing is a unique sport because of the multiple conditions to which the skier is exposed - ski equipment, the environmental conditions, and the skier themselves. In 1983, McCormick (1985b) surveyed 60 alpine skiers with a disability at an U.S. regional championship. He reported that 27% of these skiers had sustained at least one injury during their skiing career, which calculated to an overall injury rate of 2 injuries per 1,000 skier-days. In 1985, the same author

(McCormick, 1985a) surveyed 23 racers using a sit-ski to report an injury rate of 16.1 injuries per 1,000 skier days, which is eight times the skier with a disability who does not use the sit-ski. The injury rate for alpine athletes in this study was reported to be 9 injuries per 1,000 skier-days calculated for athletes participating in both *disability standing* and *disability sitting* groups. According to a study by Laskowski & Murtaugh (1992), the data for alpine skiers gathered from multiple sites suggested that the skier with a disability is at no greater risk of injury than able-bodied skiers, both in terms of actual incidence rate and severity. They reported an injury rate of 2.9 to 4.3 per 1,000 skier-visits. Although this rate was much lower than the rate of the current study, it is important to note that the data collected by Laskowski & Murtaugh (1992) was in a controlled environment as skiers were involved in lessons under the supervision of instructors. The injury rate among alpine skiers found in this study was higher than the rate for ski injuries from skiers without disabilities, with rates of 2.8-5.4 injuries per 1,000 skier-days reported (Johnson, Ettlinger & Shealy, 1989; Sherry, 1984). While these studies collected injury information sustained while skiing, no definition of injury was given, therefore, injury rates are compared with an understanding of this assumption. Ice sledge hockey, a contact sport which included the risk of collisions with other players, the playing environment and hockey equipment reported a much lower injury rate than alpine skiers, but a slightly higher injury rate than nordic skiers. With the lowest injury rate among the 3 sports, nordic skiing resulted in a relatively safe or low risk sport. Currently, there is no sport injury information on these sports in the disability sport literature.

Statistical analysis also revealed that the duration of years of disability was associated with a sport injury. Currently, there is no literature available regarding long term consequences of participation or the effect of the number of years of disability on sport injury. Athletes with fewer years of disability are mainly in the sport of alpine skiing, with a similar pattern, but less in magnitude than seen in the nordic sport. In the sport of ice sledge hockey, most of the athletes have a longer experience of disability. Perhaps athletes with fewer years of disability have less experience with disability in the sport. This explanation is, of course, conditional on the limited observations. Future analysis should gather more observations from within the different sport types in order to focus on the different factors of risk when sport type is adjusted for.

Injury trends were depicted by the sport type and the style or body position during participation. By sport, alpine athletes reported more than 36% of the injuries involving the thigh and knee. The results of this investigation parallel those of Ferrara and colleagues (1992) and McCormick (1985b) which identified the knee in the majority of the injuries reported by the ambulatory skier with a disability. Athletes from both nordic and ice sledge hockey identified upper extremity injuries to the shoulder, wrist and hand. By style of participation, athletes in the *disability sitting* group reported a higher injury rate than the athletes categorized as *disability standing*. The injury rate for athletes in the *disability sitting* group in this study (7.3 injuries per 1,000 athlete-exposures) was much lower than the injury rate of 16.1 injuries per 1,000 skier days for skiers using a sit-ski as calculated by McCormick (1985a). Since nordic skiing has been identified as a relatively low risk activity compared to alpine skiing, the lower injury rate for this study was probably a result of using injury data from both alpine and nordic sports. Further, 85% of the chronic injuries of this study were reported by athletes in the *disability sitting* group. The results of this investigation parallel those of McCormick (1985a), who found that the exposed upper body region sustained the injuries in skiers using sit-skis. The joints of the upper extremity absorbed the majority of direct impact during falls as well as being used extensively for mobility.

Although the type of disability was not statistically associated to a sport injury, studies have reported that athletes with certain types of disabilities were vulnerable or had a higher frequency of injury. In this study, per disability, 93% of the athletes with spinal cord injuries reported a sport injury, followed by 44% of the athletes with amputations. These findings are similar to those reported by McCormick (1985a) who calculated that the type of disability for the skier using a sit-ski appeared to be related to the likelihood of an injury. In this study, all athletes with spinal cord injuries except one athlete, used a sit-ski. Further studies, including the current study, showed problems were more frequent in athletes with disabilities such as paraplegia and polio (N=15), than in competitors (N=12) with other disabilities (Jackson & Fredrickson, 1979; Hoeberigs, Debets-Eggen and Debets, 1990). Contrary to this, Nilsen, Nygaård and PerGunnar (1985) stated that athletes with paraplegia have a lower sports injury risk than other categories of athletes. The low sports injury risk reported was confounded by direct supervision of a training schedule and injury management.

Injured athletes in this study did not always seek medical care or services for their injuries, and more specifically, for injuries that were chronic. Fifty percent of the chronic injuries were self-treated by the athlete. Since a high number of athletes self-treated their chronic injuries, there may not be a clear picture or understanding of the injury profile of this group from a medical perspective. Athletes who self-treated injuries reported that personal experience and consulting peers provided the knowledge of how to treat or care for an injury. More injured athletes (73%) sought medical care for their injuries than the findings in other related studies (Ferrara et al., 1992; Ferrara & Buckley, 1996; McCormack, 1991). When athletes did seek medical attention for an injury, health services was accessed primarily through family physicians. The ongoing involvement of physicians and other members of the sports medicine teams is crucial for the athlete with a disability as the emphasis in sport moves to a competitive and elite focus. A study by Curtis and Dillon (1985) examining 128 athletes with disabilities who trained on their own, not closely monitored by medical teams and qualified coaches, revealed a high percent of reported injuries (72%). A comprehensive team approach reiterated by Ferrara & Davis (1990) should be involved in providing physical screening assessment to determine if any musculoskeletal deficiencies are present that may predispose the athlete to injury. Based on an assessment, corrective and preventive programs can be designed to reduce the rate and severity of injury.

The prevention of injuries has been associated with the incorporation of certain training activities as part of a regular sport participation program (American College of Sports Medicine, 1998). Improper or poor conditioning or cumulative exposure with pre-existing chronic conditions could result in the increased frequency of overuse injuries (Shephard, 1990). Based on the frequency and session duration of the training of these athletes, it was concluded that a sufficient stimulus is provided for producing a training effect (American College of Sports Medicine, 1998). In the current study, alpine athletes trained with cardiovascular activities (aerobically and anaerobically) 3 times per week or more, while nordic athletes primarily trained aerobically 4 to 5 times per week. According to the American College of Sports Medicine (1998), both groups of athletes were meeting the physiological demands of their sport and specificity of training. On the contrary, sledge hockey athletes in this study performed cardiovascular activities only 1 to 2 times per week, with anaerobic activities reported once per week. This frequency is generally not a sufficient stimulus for developing and maintaining fitness. Optimal physical conditioning in hockey is reported to be 85% anaerobic and 15% aerobic training (Arnheim & Prentice, 2000). These athletes spent minimal sessions of cardiovascular activities as recommended by the American College of Sports Medicine (1998). Future research should focus on insight into the intensity or technical skills of a training session for each sport.

Sixty percent of the respondents requested more information on training and conditioning specific to their sport. Petrofsky (1977) reported that training skiers with disabilities is the same as a skier without a disability. Yet, athletes reported few qualified coaches in the area of disability sport, a familiar observation for the competitive athlete (Ferrara et al, 1992; Curtis & Dillon, 1985). DePauw and Gavron (1991) found that athletes with disabilities have, for the most part, practiced on their own. Overall, only 50% of these athletes reported training with a coach, with specific attention to the lack of coaching involvement for nordic athletes. This analysis has identified certain groups at a higher risk for injury than others, such as athletes categorized in the disability sitting group. McCormick (1985a) reported that skiers using a sit-ski are at a high risk for injury. The data from this study indicated that there were no coaches for skiers using sit-skis, thus increasing the vulnerability of this group to injury. Qualified coaching is important not only for sport performance, but for safe participation of the athletes. Davis and Ferrara (1991) reported significant differences between elite athletes training with a coach versus without a coach for conditioning. Coaching responsibilities can include and promote appropriate training techniques, equipment changes, protective gear, strategies for injury prevention, and the overall wellness of the athlete which balances the benefits of sport participation against the risks. Moreover, coaches must be made aware of problems or issues by the athletes in order to have a positive influence on the athlete and his or her sport experience.

To confound the training profiles and injury reports, athletes encountered disability-related obstacles which resulted in a limitation to participation. Alpine and nordic skiers ranked problems associated with sport funding, transportation and adaptive equipment for training as major obstacles to their training. Ice sledge hockey athletes ranked adaptive equipment, venue accessibility and sport integration as major contributors to participation. Similar concerns to this have already been reported in the literature (Murphy-Howe & Charboneau, 1987). Access to information about sport programs, education and initiatives for participation should be encouraged. As well, few opportunities for participation by women were reported as a disability issue, represented by the relatively small number of female participants in this study (22%). A current mandate of the International Paralympic Committee addresses the issue of the low numbers of female participants in disability sport (IPC task force report, 1996).

Injuries sustained during sports activities may not only have serious ramifications for future sport participation, but for the everyday life of the athlete with a disability. Despite the risks of sports injuries, the positive aspects for the psychological and physical well-being must not be forgotten. Although it is important that proper treatment for sports injuries is implemented, prevention is even more imperative. Educational strategies to teach the athlete the importance of a health care team as well as specific injury prevention programs should be addressed for each sport. Training programs and injury prevention for athletes with disabilities are relatively under researched. This area of research is important since many of the injuries and their complications are preventable. Based on this information, sport-injury intervention strategies could be recommended and implemented. The information developed from this project may be used to target educational and training programs designed to reduce and prevent athletic injuries, injury treatment and rehabilitation. The result is optimal athletic performance.

Conclusion & Recommendations

Sport injuries for the winter Paralympian athlete are common. This study showed that injuries of the winter athlete with a disability were most strongly influenced by the type of sport and the style of participation. It appears that athletes are training on their own, not closely monitored by medical professionals or qualified coaches. The findings reflect a need for coaching and more appropriate sources of sport-specific training information. Participants should receive additional interventions to reduce sport injury risk such as appropriate training techniques, effective use of sport equipment, injury prevention and injury management strategies. Educational strategies should be implemented to teach the athlete the value of a health care team to assist in injury prevention and regaining competitive form as quickly and safely as possible. Post-injury, due to the lack of involvement of the medical staff, athletes need to understand injury and the consequences of an untreated or chronic injury. A comprehensive medical team should implement an injury prevention program focussing on improving the overall sport-specific and disability-specific needs of the athlete with a disability.

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CHAPTER 3

The Training History and Sport Injury Experience in Sledge Hockey Players

Introduction

For both the recreational participant or the competitive athlete, the evolution of sledge hockey has enabled many people with a disability to enjoy the game. Sledge hockey is a team sport that incorporates the same discipline structure as ice hockey except for a few modifications in rules and adaptations of equipment to meet the needs of the players. The basic equipment is a sledge, which is a tubular frame supported by metal skates, and two picks, which the players use to manoeuver their sledge as well as to shoot, pass and stick-handle the puck.

The first game of sledge hockey was played in Norway in the late 1960's and was primarily played in Europe until it was introduced in Canada during the late 1970's (Campbell, 1992). The rules of play in Canada have been designed to allow everyone to take part, regardless of athletic ability, sex, age, or disability. Improved access to ice arenas and the continued evolution of the sledge have resulted in an increase in participation levels and rapid development of the sport.

During the last 20 years, Canadian teams have excelled at sledge hockey on an international level. The international rules for sledge hockey, which are overseen by the International Sports Organization for the Disabled were drafted from Canadian rules. The Canadian team earned consecutive gold medals at the first two world cup tournaments in 1991 in Norway and in 1992 in Quebec. The VI Paralympic Winter Games in Lillehammer, Norway in 1994, saw another first as ice sledge hockey was formally recognized by the International Paralympic Committee as athletes from 9 countries competed for the gold medal.

Given the newness of the sport, the participants in sledge hockey have never been profiled, and information regarding the mechanisms and types of injuries characteristic of this game have never been obtained. Literature review reveals no epidemiological data or injury reporting systems to organisations. As the number of participants increase, and the competitive level continues to grow, so must the knowledge of the parallel professions that support it. Technology and design of equipment, coaching, physiological training and sports medicine will need to be addressed to enable athletes to excel at their optimum level of participation, and ultimately, at the highest level of international competition in a safe and effective manner. The purpose of this study was to profile the elite participants in Sledge Hockey of Canada, by taking inventory of the type and frequency of training, and by describing the type, location and rate of sport injuries during one season.

Methods

Subjects

Participants registered with Sledge Hockey of Canada (SHOC) during the 1994-95 season were asked to participate in this study. The fifty-five players were identified and participated in national team events and on a local team sledge hockey schedule.

Data Collection

The questionnaire was devoted to collect demographic data and describe individual training and sport injury experiences of sledge hockey participants for one season: September, 1994 to April, 1995. The questionnaire was developed from a preliminary study, Training history and sports injury profile of athletes at the VI Paralympic Winter Games, with physician and therapist input, and a pilot test with a local sledge hockey team. Two data collection instruments were developed in the format of closed-ended and multiple-response items. The Athlete Profile Form (Appendix C:Sledge Hockey Athlete Profile) collected the demographic data and training information. This form was completed by all consenting participants. Participants who sustained an injury as a result of his or her participation were instructed to complete the Sports Injury Form (Appendix D:Sledge hockey sport injury / illness reporting form). For the purpose of clarification to the participant, an injury was defined as:

> *any trauma that occurred during any practice or competition which required medical care OR resulted in modifying or stopping your participation in sledge hockey for any given length of time.*

With assistance from SHOC, player contacts were provided for the investigator for each province. Prior to the end of the season, preliminary phone calls were made to each team to identify the participants. A follow-up introductory letter was sent to the players to notify them that a questionnaire would arrive at the end of the season, which asked for their support. Athletes were also informed that the research project was supported by Sledge Hockey of Canada and approved by the Faculty of Physical Education and Recreation Ethics Review Committee at the University of Alberta.

Data was collected at the end of the 1994-95 sledge hockey season in the form of a self-reported questionnaire. Questionnaires were mailed to the identified contact person per team for distribution to team participants at the final tournament competition. Each package included an introductory letter, consent forms (Appendix E: Consent form), the athlete profile form, three sport injury forms and a self-addressed stamped envelope. In the letter, participants were given an explanation of the purpose of the study, made aware of the voluntary nature of their participation and were assured of confidentiality. Participants signed the consent form (Appendix E: Consent form), completed the questionnaire, and returned all information to the investigator via mail. Twenty-two questionnaires were returned to the investigator. A follow-up letter and 2 phone calls were made to participants for non-returned questionnaires. Only 2 completed questionnaires were returned as a result of these efforts.

Analysis

Data regarding demographics, training frequencies and sport injuries involved simple frequency counts and percentages. Injury rates were expressed by the number of participants in sledge hockey and the participant-exposures (opportunity for an athlete to be injured while participating in a sledge hockey game or practice).

Results

Demographic Profile

Twenty-four participants from the provinces of British Columbia, Alberta, Ontario and

Quebec returned the questionnaire, providing a return rate of 44%. Table 3-1 identifies the mean and standard deviation of the participants' age, years since the onset of disability, years of sport participation and the type of disability (acquired or congenital). Overall, the average age of the sledge hockey participants was 29.9 years, but players between the ages of 12 to 47 years participated. The average number of years of participation in sledge hockey was 4.5 years while the average number of years of onset of subject's disability was 24.2 years. Eighteen respondents participated solely within their recreational league schedule, while six respondents reported international sledge hockey experiences. Fifty-eight percent (N=14) of the respondents reported their disability as congenital which included participants with cerebral palsy (N=7), spina bifida (N=4), mental disability (N=2) and a birth deformity (N=1). Participants who acquired their disability included players with an amputation (N=5), spinal cord injury (N=3) and polio (N=2) as causes. Of those who acquired their disability, 70% (N=7) participated in physical activity prior to their disease, accident or trauma. Forty-two percent (N=10) of the respondents reported their ice sledge hockey position as forward, 33% (N=8) as defence, and 25% (N=6) participated as a goalie.

Athlete Training Profile

Participants reported their on-ice sledge hockey training during the season, shown in Table 3-2. Overall, participants trained less than two days per week for approximately 3 weeks a month, for an average duration of 1.5 hours per practice session. This training frequency remained fairly consistent for the months reported. In addition to on-ice practicing, participants played 2 games per month, with a frequency high during the month of February,

TABLE 3-1: Participants' Demographics for age, years of onset of disability, years in disability sport, level of participation, and type of disability (mean and standard deviation)

SUBJECTS	N	AGE Years Mean (SD)	YEARS OF DISABILITY Mean (SD)	YEARS IN DISABILITY SPORT Mean (SD)	LEVEL OF PARTICIPATION			TYPE OF DISABILITY	
					Local	International	Paralympic	Acquired	Congenital
Athletes	24	29.8 (10.2)	24.2 (12.7)	4.5 (3.0)	18	1	5	10	14

TABLE 3-2: The mean scores and standard deviations of the training frequency expressed in number of weeks per month and the number of days per week, and the duration of a practice session for sledge hockey athletes

Month	Mean no. of Weeks practice mean (SD)	Mean no. of days practice per week mean (SD)
September	1.75 (1.98)	0.83 (1.24)
October	3.63 (1.01)	1.54 (114)
November	3.79 (0.72)	1.79 (1.53)
December	3.21 (1.14)	1.88 (1.60)
January	3.46 (1.06)	1.83 (1.58)
February	3.71 (0.99)	1.83 (1.58)
March	3.42 (1.25)	1.79 (1.47)
Season Average	3.19 (1.42)	1.64 (1.49)

due to hockey tournaments (Table 3-3). The average duration of on-ice play per participant was 45.22 minutes (SD=15.04) per game.

Participants reported the frequency of specific activities such as flexibility and weight training for dry-land training, and cardiovascular training for both aerobic and anaerobic training for on-ice training. The responses are profiled in Figure 3-1. The most frequently reported activity was flexibility training, which averaged slightly more than one session per week, whereas aerobic, anaerobic, and weight training were reported less than one session every two weeks. The frequency of these sessions remained consistent during the entire season.

Ninety-two percent of the participants (N=22) reported practicing and competing under the direction of a volunteer coach, who had sledge hockey experience but no coaching certifications. Sixty-seven percent (N=16) of the respondents reported performing either a general or a specific warm-up prior to practice or game, yet only 33% reported a cool-down phase at the end of each session. Overall, 54% of the respondents reported participating in other sports regularly (N=13) more than twice per week. The most frequently reported activity was wheelchair basketball (N=9).

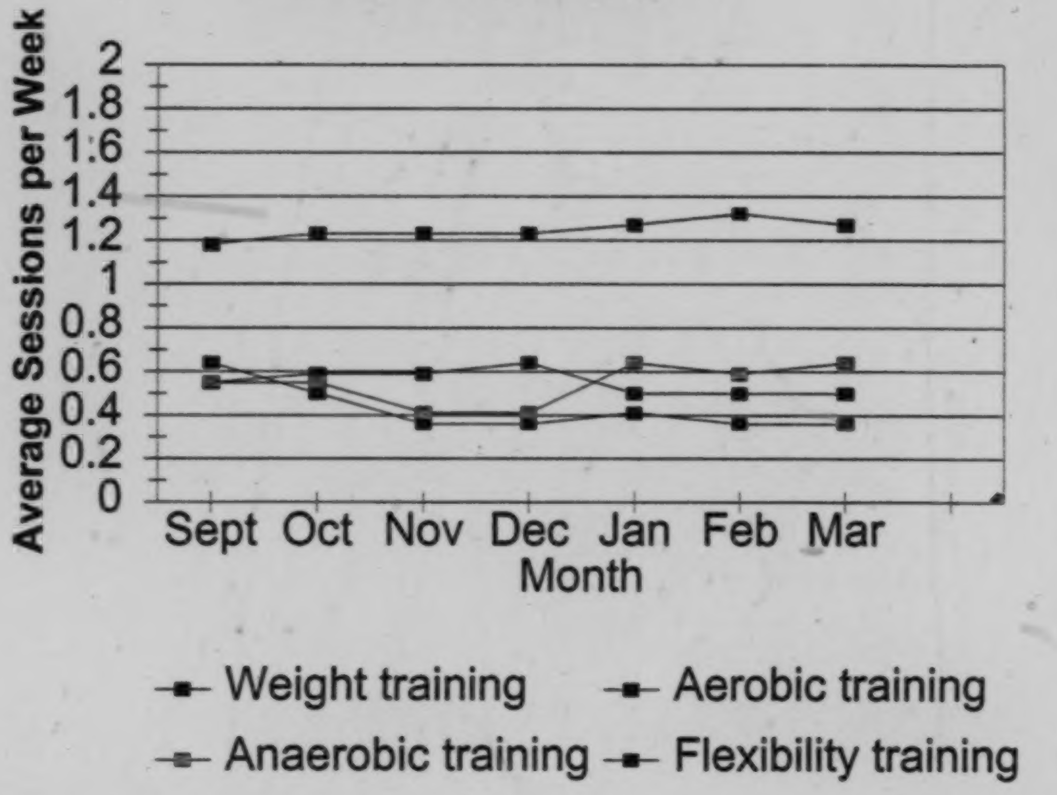
Equipment

Seventy-five percent of the players used a low-back sledge. Players reported that the low-back sledge allowed for more mobility on ice, while the high-back sledge added support and balance. All sledges were the same height above the ice (3.5 inches). All athletes used at least 2 straps to secure the sledge to their trunk and legs, with 87% of the athletes padding

TABLE 3-3: The mean number and standard deviations of the games per month and overall duration of average ice time for sledge hockey participants

Month	Games per month mean (SD)
September	0.58 (1.81)
October	1.58 (1.67)
November	2.50 (1.41)
December	2.29 (1.87)
January	2.21 (2.08)
February	2.92 (1.88)
March	2.29 (1.96)
Season Average	2.05 (1.92)

Figure 3-1: Training Activities for Sledge Hockey Participants



the seat and sledge to promote whatever upper body support the players required. Every athlete wore a hockey helmet, with a full face mask. Mouthguards were not reported by any of these athletes. Ice hockey gloves were worn by every participant except for the goalies, who used a trapper mitt and blocker glove. Eighty-seven percent of the players used a neck protector and 71% used a chest protector. For upper extremity protection, shoulder pads were worn by 75% of this group, while 79% used elbow pads. Only 62.5% of the participants used knee pads, with few athletes who used shin pads (16%) or protective boots (16%).

Sports Injury Profile

Participants reported 1,215.64 athlete-exposures (AE) of combined practice and games situations or opportunities for an ice sledge-hockey injury. Six injury report forms which resulted from sledge hockey participation were completed. An injury rate was calculated at 4.9 injuries per 1,000 AE.

By definition, reported injuries affected sledge hockey participation or required medical care. All six of the injuries resulted in time-lost for participation. The mean number of days lost for participation was 16.67 days (SD=26.74). Overall, 50% (N=3) of the injuries were minor (time-loss of 7 days or less), 2 injuries were moderate (time-loss of 8-14 days), and 1 injury was major (time-loss of 21 days or more). As for medical care, four of the reported injuries were medically evaluated by an emergency physician in a hospital setting. Two injuries were reported to be cared for by the injured participants, or self-treated.

Eighty-three percent of the injuries were to the upper extremity (N=5), with one injury located to the spine (N=1) as depicted in Figure 3-2. The most common injury site was the hand and fingers (N=3), followed by shoulder (N=2). Five of the 6 injuries were classified as new or acute defined as injuries that occurred for the first time. One injury was chronic, identified as a re-injury to the shoulder musculature.

Fifty percent (N=3) of the injuries resulted from game play with the remaining 50% occurring during sledge hockey practices. As there were more participant exposures to practice sessions than game situations, practice sessions provided a greater opportunity for injury. Yet, the risk of injury during a game situation (8.7 injuries per AE) was greater than a practice session (3.4 injuries per 1,000 AE). Injuries during game play occurred at the end of the game in all cases. Five of the six injuries were a result of contact from either another player or the equipment such as the boards, puck or sledge.

Thirty-eight percent of the participants reported that they had received injury prevention information, while 58% requested more information.

Disability-related problems

As the athlete with a disability may be prone to setbacks in training routines that are not directly related to sport injuries (Ferrara, Buckley, McCann, Limbird, Powell & Robl, 1992) and due to the newness of the sport, the investigator was interested in any disability-related illness or issues associated with sport participation. One athlete reported a disability-related illness that affected sledge hockey participation. A pressure sore in the buttocks region resulted in a significant amount of time-loss from participation

Figure 3-2: Location of sport injury for sledge hockey participants

Hands and fingers	50%
Shoulder	33%
Back	17%

(60 days). The participant reported that transfers from the wheelchair to the sledge, and friction due to movement during participation contributed to the ulcer. While this time-loss injury was not analysed in this data, the seriousness of this injury and the major time loss from participation from this injury warranted mentioning.

All participants with an amputation (N=5) reported stump problems with the cold temperatures and protection of the stump during contact. Sixteen percent of respondents reported lower extremity temperature-regulation problems due to the cold environment. Further issues such as a lack of available and affordable adaptive equipment, lack of the number of participants to form a team, and inaccessibility to ice arenas were reported as problems for sport participation.

A person with a disability may be prone to use of medications, that are related to their disability. Twenty-five percent of the respondents reported taking medications, primarily anti-inflammatory (N=3), antibiotics (N=2), and blood pressure medication (N=1). Twenty-nine percent reported taking vitamins as a nutritional supplements (N=7).

Discussion

The sport of sledge hockey is still very young, with a short period of participation for Canadian sledge hockey participants. This study was descriptive in nature, with questions about a wide range of risk factors associated with injury for the purpose of hypothesis generation and direction for further research. Collecting retrospective information on training and sports injuries over one season was appropriate for this sport at this time in its history (Walter & Hart, 1990). With the data collected, this group of respondents can be profiled with limited generalizability, and a focus on hypothesis generating.

The low response rate to this survey raises a concern about the representativeness of its respondents. Difficulties on follow-up of non-returned questionnaires were encountered such as non-compliance and tracking individuals Participation in league play was informal and sporadic, with the focus of the organization on inclusion not administration. Competitions were sporadic, with tournaments cancelled when numbers were insufficient or teams added to tournament schedules ad hoc. A future study, in collaboration with SHOC is recommended, with data gathering to occur at the major competitions, for example, as a part of tournament registration, a similar technique utilized by Ferrara, Buckley, McCann, Limbird, Powell and Robl (1992).

For the purposes of this study, the definition of injury was broad enough to gather minor and major time loss injuries and injuries where participants played in pain and discomfort even without any time-loss. The injury had to either affect participation in any way, for any given length of time or resulted in medical care. This definition also allowed for the inclusion of untreated injuries. Injuries were ascertained by self-report for the athlete, with new injuries being distinguished from recurrences. In examining group information, it was possible to observe injury patterns in this small sample size.

The sport of sledge hockey may have its own inherent risks for injury. Sledge hockey is a contact sport, which includes risks of collisions with other players or the net, check into the boards, hit by the puck, pic or the sledge. Eighty-three percent of the injuries resulted from trauma as a result of collision or contact with either the sledge, puck, boards or another player. As physical contact is inherent in hockey, it is important that players wear standard personal protective equipment. While players have the option of a high or a low back sledge to augment stability and cambering, all sledges were a standard 3.5 inches off the ice, which insured that during games, sledges contacted each other frame to frame and one sledge will not spear the body of an opponent. With the body strapped to the sledge, making the sledge an extension of the lower body, athletes were able to manoeuver the sledge by slight body movements. While this assisted in player control of the sledge, athletes who did not develop this skill adequately were not able to overcome the speed and sharp turns to avoid collisions with other players, the boards or the net. This mechanism of injury just described was the cause of the major time-loss injury (70 days) reported in the data. Unable to stop or manoeuver the sledge, an athlete hit the boards, fracturing a spinal vertebrae. While the time-loss for the six injuries was reported to be 16 days, this mean was inflated by the data of one player who reported an injury which resulted in 70 days from participation. Excluding this major injury, the average time-loss was 6 days (SD=6.4).

Essentially, sledge hockey participants wear the same hockey equipment as the able-bodied hockey player, with shoes in place of ice skates. Due to the nature of participation, an athlete participating while sitting, exposes the upper body to injury in a contact sport. In this study, all injuries reported were located in the upper body and trunk. While all the athletes used standard hockey gloves for hand protection, the hand and fingers were the most common injury location among this group. During play, the athletes rotate the sticks between propelling the sledge and passing or shooting the puck. Different positioning of the hands and wrist rotation result in various types of shots and passes. As well, the sledge has specific measurement requirements as dictated by sledge hockey regulations, that nothing is allowed under the sledge except for the blades. The puck must be able to slide on the ice under the sledge. Directionality of puck passing under the sledge exposes the hand and fingers to the blades under the sledge. Standard leather gloves may be effective for puck or player contact, but these gloves do not provide the necessary protection of the fingers from the edge blade or the end of the ice pic. This mechanism of injury resulted in two of the six reported injuries, with hand and finger lacerations and finger amputations. As a result, it is recommended that the durability and material of a sledge hockey glove be explored to provide the necessary protection to prevent further injury to the hand and fingers. The shoulder, which was protected by shoulder pads for only 75% of the players was the second most common injury site. The style of participation targets injuries to the shoulder and the surrounding area. Not only is the shoulder vulnerable to contact, the upper extremity is also used as the mechanism for mobility as the weight-bearing limb. The players require well-developed upper body strength in order to control the sledge. Combined with fatigue, which may be confounded by a lack of training, the end result is an increase in the rate of upper extremity injuries.

Besides physical contact, another important factor is conditioning. Sledge hockey is played on a field of ice equal in size to official National Hockey League playing area requiring considerable stamina. In this study, the frequency of participation does not give insight into the intensity or technical skills of a session, but provided only an observation of the training frequency and session duration possibly identifying trends and calculating participant exposures. Sledge hockey practices and training were consistent over the season, possibly a result of available ice time and the structure of league schedules. Further, off-ice training, such as weight training or cardiovascular conditioning was minimal. Even the few Paralympic athletes among the group did not affect the overall trends. It was interesting to observe that although the sledge hockey athletes from the previous study Sports Injury Profile of Athletes with a Disability from the VI Winter Paralympic Games were considerable lower than the training frequencies for nordic and alpine skiing, they were considerable higher than the training data in this study. The results of this investigation indicated that the participants may not be achieving optimal physical condition. Hockey is a physically demanding sport, and serious injuries may occur to the participant who is not in good physical conditioning (American Academy of Pediatrics, 1994). These athletes did participate in related activities that could improve their conditioning, but not to a sufficient volume of training, which has been reported to be 3-4 times per week (American College of Sports Medicine and Science, 1998). One of the responsibilities of the coach is to oversee the training program of the team, by providing guidance and direction. While the majority of the athletes reported that they were under the supervision of a coach, there was no formal program in place to monitor the coaching standards or their qualifications. The level of a qualified coaching that these athletes are exposed to may be a major factor that affects both training profiles and injury rates.

Participants in the sport of sledge hockey have ignored or accepted the risks of injury by their continuation of play even without guidance, supervision, coaching and minimal research. Athletes will soon turn to the medical professionals and sport scientists for expertise in training and the prevention of sport injuries. Protective equipment design for safe participation also needs further assessment. Based on these findings, it appears that it is not the injuries that are restricting the level of the sport, but the sporadic training, access to ice, informal league schedules, and the number of participants that may be the restricting factors for overall participation.

Conclusion and Recommendations

This study examined the injury rate and types of injuries sustained by ice sledge hockey players and the relationship of training methods and equipment to injury occurrences. From these data, injuries were reported to be sport-related not disability related. The organization should begin to standardize rules governing the compulsory wearing of protective equipment. In particular, the type of hockey gloves that the athlete uses needs to be designed in such a fashion as to protect the fingers and hands from the blades of the sledge (meat-cutter glove design). Future studies should focus on this sport, with attention given to the patterns of injury within sledge hockey under practice and competitive conditions. In addition, the role of officials and referring has not been addressed in this study but could be a factor in injury and injury prevention.

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CHAPTER 4

A Prospective Study of Injuries in Canadian Women's Wheelchair Basketball

Introduction

In order to make well-founded decisions on different components of the medical care of athletes, more information is needed in the area of disability sport. Athletes, medical professionals and decision-makers face many issues with little research data to support or refute respective contentions. The sport setting is unique in terms of the complexity of variables associated with an injury episode, but it is ideally suited for epidemiological research (Haddon, 1980; Noyes & Albright, 1988; Walter, 1985). In fact, Noyes & Albright (1988) strongly promote the notion that all sports medicine research should be approached epidemiologically from the outset to understand sport injury. The efficiency of examining sport-related injury frequency data using standard epidemiological techniques have been previously established (Noyes & Albright, 1988; Clarke, 1976) yet, in disability sports, very little epidemiological research has been conducted on sports injuries. It has been recognized and reported that there are particular risk elements involved for athletes with disabilities in sport (Curtis & Black, 1999; Curtis & Gailey, 1996; Davis & Ferrara, 1995). As well, certain sports such as wheelchair basketball has been identified as an activity with a high frequency of injuries by a few studies (Curtis & Dillon, 1985; Burnham, Higgins & Steadward, 1994; McCormack, Reid, Steadward & Syrotuik, 1991).

The majority of the data on sport injuries for athletes with disabilities have been gathered from cross-sectional surveys utilizing retrospective data for a descriptive analysis. Of the research articles which address sports injuries, only a small portion study the Canadian wheelchair athlete (McCormack, Reid, Steadward & Syrotuik, 1991; Burnham, Higgins & Steadward, 1994; Burnham, Newell & Steadward,1991). Although some studies permit level of participation comparison, no study has established the incidence of injury in a season of wheelchair basketball.

In the prospective design, the accuracy of reported injury rates, location of injury, and time off due to injury should be significantly greater since data was collected on a weekly basis throughout the season (Ferrara & Buckley, 1996). Previous studies have been unable to document the ratio of injuries to exposures because of the retrospective design. The importance of monitoring the pattern of injuries and documenting injuries as they happen is reiterated.

Therefore, the purpose of this study was two-fold: 1) to determine the rate of injury, anatomical location of injury and types of injury incurred by Canadian female wheelchair basketball players on an on-going prospective basis for one competitive season (December - April inclusive); and, 2) to demonstrate and implement an injury reporting system in the form of a registry (exposures to games and practices) for athletes participating in the sport of wheelchair basketball.

Methodology

Subjects

Participation in this study was limited to athletes registered with the Womens Division

Team of the Canadian Wheelchair Basketball Association (CWBA). The CWBA provides competitive wheelchair sporting opportunities for female participants, with or without a disability. At the final registration deadline for the women's division, 6 teams comprising of approximately 50 athletes in total, were contacted to participate in the study.

Description of the Instrument

The study design was a prospective cohort model to identify an individual's risk of injury while participating in wheelchair basketball. An injury reporting surveillance system was developed using the following forms: Participant Profile, Weekly Exposure, and Sports Injury/Illness forms.

The Participant Profile Form described athlete demographics, wheelchair basketball experience, and previous injuries (Appendix F: Participant Profile Form). This form was completed prior to the commencement of the study, along with a consent form (Appendix G: Consent Form) which outlined the voluntary nature of the project, support of the project from the CWBA, and approval by the Faculty of Physical Education and Recreation Ethics Review Committee at the University of Alberta. The completed profile form provided the establishment of the athlete registry, and a code number for each athlete was established for the purpose of confidentiality.

The Weekly Exposure Form was used to establish exposure information by documenting wheelchair basketball practices and games, and the length of the session (Appendix H: Weekly Exposure Form). The exposure form allowed cross-validation by comparing the data from this form to the Sport Injury/illness Report form to assess how complete the injury reporting forms were, and if the reporting was inclusive.

The Sport Injury/Illness Report Form, designed for wheelchair basketball, documented the injury experience (Appendix I: Sports Injury/Illness Report Form). This form consisted of closed ended and multiple-response items, with space provided for comments.

For the purpose of clarification to the athlete, an injury was defined as:

> *any injury or disability-related illness that resulted in stopping, missing or modifying a practice or game, OR resulted in medical care.*

Data Collection

With assistance from the CWBA, a contact person on each team was identified. Introductory letters were distributed to the participants inviting participation. This letter was followed by an in-service session conducted by the investigator at a preseason tournament where all potential subjects were in attendance. Each athlete was given an accompanying instruction package which explained the study and the time commitment needed for participation in the project. Athletes were made aware of the voluntary nature of their participation and the importance of confidentiality was emphasized. After athletes signed consent forms for participation, they completed the Participant Profile Forms. Athletes were given Sports Injury/Illness Report Forms and Weekly Exposure Forms for the duration of the season (December - April: 5 months). Completed forms by each individual athlete were mailed to the investigator using pre-paid self-addressed envelopes on a monthly basis.

Statistical Analysis

Simple descriptive statistics were used to describe participant demographics and injury frequencies. Injury rates were expressed as number of injuries as per 1,000 exposures to a potential injury. An athlete-exposure (AE) was defined as a practice or game session in which there was an opportunity for a participant to be injured.

Results

Subjects

Twenty-two female athletes (44%) agreed to participate in the project. One athlete discontinued her participation shortly after consenting due to surgery one month after the beginning of data collection. Her information was not included in the analysis. Table 4-1 presents descriptive demographic information about the 21 participants. The average age for this group was 28.5 years (SD=5.8). Forty-three percent of the athletes (N=9) had a disability, with an average disability duration of 22.1 years (SD=12.5). Athletes reported that their involvement with wheelchair basketball was a relatively recent phenomena, with mean years of participation of 4.4 and 5.7 years respectively. The number of years of involvement in wheelchair basketball for athletes with a disability and athletes without a disability were similar and not statistically different ($P>0.05$). Fourteen of the 21 (67%) athletes played guard, and 7 (33%) forward or centre. Relatively few athletes had experienced international competition (29%), and all athletes stated that their training sessions and games were supervised by a coach.

TABLE 4-1: Participant Demographic Information for age, years of onset of disability, and type of disability (mean and standard deviation)

Participant	N	AGE Years Mean (SD)	YEARS of Disability Mean (SD)	YEARS in Disability Sport Mean (SD)	TYPE of Disability Acquired	Congenital
Athletes with a disability	9	30.2 (6.8)	22.1 (12.6)	5.7 (4.3)	7	2
Athletes without a disability	12	27.3 (4.8)	NA	4.4 (2.9)	NA	NA
Total	21	28.5 (5.8)	22.1 (12.6)	5 (3.6)	7	2

Sport Injury/Illness Results

During the study period, 26 Sport Injury/illness forms were completed. The type and pattern of injuries and illnesses are presented in Table 4-2. Of the 26 reports, 85% (N=22) were musculoskeletal (MSS) injuries and 15% (N=4) of the reports were for general medical illness or disability-related problems that prevented participation.

All of the MSS injuries were acute (95%) except for one injury which was a re-injury to the shoulder musculature. Sprains to the hand and fingers (N=5) and strains to the shoulder (N=4) were the most commonly reported injuries. The upper extremity (N=13) was injured more frequently than the spine (N=4), lower extremity (N=2) or head (N=1).

General medical illness or disability-related problems that prevented participation accounted for 15% (N=4) of the injury reports. Common medical illnesses reported included colds and flu (N=3). Only 1 disability-related illness was reported which affected the athlete's participation. A spastic episode resulted in a fall, medical visit, as well as time lost from participation.

Twenty-six injuries for 21 athletes represented a rate of 1.2 injuries per person. Using Athlete-Exposures (AE), an injury rate of 27.2 injuries / 1,000 AE. was calculated. This rate excluded all forms reporting medical illnesses (N=4). By categorizing injuries by its occurrence, the injury rate for practices was 26.0 injuries / 1,000 AE, and for games was 31.5 injuries / 1,000 AE. Injury rates between the athletes with and without a disability were calculated. Athletes with a disability reported an injury rate of 32.6 injuries/1,000 AE, a similar rate for athletes without disabilities (31.6 injuries/1,000 AE).

TABLE 4-2: Body Part by Injury Type

	Injury Type					
Body Part	**Contusion**	**Wound Care**	**Strain**	**Sprain**	**Other**	**Total**
Head	1					1
Neck/Spine	1		3			4
Shoulder			4			4
Elbow		1				1
Wrist				1		1
Hand/Finger	1	1		5		7
Torso	1		1			2
Lower leg	1	1				2
Medical Illness					3	3
Disability-related illness					1	1
Total	5	3	8	6	4	26

Injury rates were also calculated based on time-loss definition of injury. Any injury that resulted in a time lost from participation of > 24 hours was used in this calculation of injury rate. Injury rate calculated based on time-loss definition was reported to be 12.3 injuries / 1,000 AE. Following the same definition for injury rate, games at 17.2 injuries / 1,000 AE was greater than the injury rate for practices, at 8.7 injuries / 1,000 AE.

All reported time-loss injuries for musculoskeletal were minor (< 7 days). Injuries to the hand and fingers accounted for an average of 3.5 days lost to participation, followed by the shoulder at 1.7 days (Table 4-3). Illness and disability-related problems accounted for the greatest days lost at 5.25 days.

Seventy-seven percent of the reported injuries were not medically evaluated. The most commonly reported methods of self-treatment were ice, over-the-counter medications, support taping, and massage. Of the 23% of the injured athletes who sought medical care post-sport injury, the physiotherapist was the primary care giver.

Discussion

This study is the first prospective study investigating exposures (practices and games) and injuries in wheelchair basketball for an entire competitive season. In Canada, wheelchair basketball is one of the more established disability sports, with a relatively high number of participants enrolled. Since there was no routine monitoring of its participants in place, female athletes in the sport of wheelchair basketball were selected as the cohort to record their sport exposure and injury experience. In addition, there is minimal research

TABLE 4-3: Body Part by Time Loss

Time Loss Injuries		
Body Part	**N**	**Mean Days Lost (S.D)**
Head / Neck / Spine	2	1
Shoulder	3	1.7
Wrist / Hand / Finger	3	3.5
Leg	2	1
Medical Illness and Disability-related illness	4	5.25
Total	10	2.86 (4.1)

conducted on women in disability sport. Female athletes have been identified as an area in need of further research and discussion (International Paralympic Committee, 1994). When the disability sport literature is surveyed, few studies of female athletes are study subjects in this research area (Curtis & Black, 1999). Per gender, female athletes represent less than one-third of the sample populations in most disability sport and sports medicine literature (Burnham, Higgins & Steadward, 1994).

Wheelchair basketball has been reported to be a high risk activity. Studies which have examined athletes who use wheelchairs, have comprised of wheelchair basketball players as part of the subject group. These studies have identified that athletes participating in wheelchair basketball have incurred injuries more than other sport groups (Curtis & Dillon, 1985; McCormack, Reid, Steadward & Syrotuik, 1991). A retrospective injury survey by Curtis and Dillon (1985) reported that the frequency of injuries associated with participation in wheelchair basketball ranked second, only to track & field. The basketball participants incurred 24% of the injuries among 5 high risk sports. McCormack, Reid, Steadward and Syrotuik (1991) identified that wheelchair basketball participants reported the highest percentage of injuries (31%) compared to other athletes participating in 18 other sports. In the first prospective study of athletes in disability sport, Ferrara and Buckley (1996) reported that wheelchair sports incurred 37% of all injuries, with no specific mention to wheelchair basketball. While the percentages of injuries in these studies identified that injuries were occurring to wheelchair basketball participants in high frequency, comparisons must be made with caution, as the group, number of participants, and exposure to injury or risk of injury has not been identified.

Although there are a number of injury studies that have examined the wheelchair athlete, only three studies to date have looked strictly at wheelchair basketball. One of the earliest studies in wheelchair basketball was conducted by Hoeberigs & Verstappen (1984). They surveyed participants at a basketball tournament and reported that 41% of basketballers reported an injury, during a 2 week retrospective period. More recently, Burnham, Higgins & Steadward (1994) found 82% of the wheelchair basketball athletes reported at least one injury during the study year. However, significant injury as defined by time loss from participation had an incidence of 18%. Shoulder pain in female wheelchair basketball players was assessed by Curtis and Black (1999). The results indicated that over 70% of wheelchair basketball players have experienced should pain since beginning wheelchair use. Greater intensity of shoulder pain was reported to be higher with daily activities than with variables associated with sports participation. The current study found 56% of athletes in this study reported at least one injury in the study period, but only 38% of the injury reports resulted in time loss participation. The increase in the percentages of injuries could be attributed to the method of data collection. The prospective design used to collect data in the present study compared to recall data in the retrospective study design conducted by Burnham and colleagues (1994) may have accounted for the large discrepancy between injury percentages.

An estimate of the frequency of injury or the injury rate clearly is a function of the definition of injury used. The defining criteria for a sport injury was difficult to develop and creating a definition based on the literature for disability sport was challenging. Sport injury has previously been defined as time-loss in participation, used by a few investigators to document the severity of sport injury (Burnham, Higgins & Steadward, 1994; Ferrara & Buckley, 1996; Ferrara & Davis, 1990; Ferrara, Buckley, McCann, Limbird, Powell & Robl, 1992), while other studies let the participant define injury (McCormack, Reid Steadward & Syrotuik, 1991; Burnham, Newell and Steadward, 1991; Wilson & Washington, 1993). For the purposes of this study, an injury had to be severe enough to affect participation (loss of participation days) or required a visit with a medical professional. By incorporating inclusionary criteria, more accurate or meaningful data can be compared to other studies. When the time-loss definition for injury rates is used in this study, the frequency and rate of injury is closer to the injury rates of other retrospective studies. This definition of injury also allowed for the inclusion of untreated injuries, since medical care for sports injuries is a reported concern for this group of athletes (Burnham, Higgins & Steadward, 1994; Curtis, 1982; Ferrara, Buckley, McCann, Limbird, Powell & Robl, 1992; McCormack, Reid, Steadward & Syrotuik, 1991). Yet, as a result of the definition of injury, many athletes who participated in pain and discomfort without any time-loss or health services may have been excluded from routine analysis, which may have resulted in under-reporting.

Injury rates have been presented in just a few other studies in disability sport (Ferrara & Buckley, 1996; McCormick, 1985). Ferrara & Buckley (1996) reported an injury rate of 9.45/1,000 AE from elite athletes in a cross-disability multi-sport project. The results indicated that 80% of the injury reports were categorized as MSS injuries, and the remaining 20% were medical illness or disability-related problems. A similar categorical profile was found in the present study, with MSS injuries slightly higher

(85%), and 15% of the injury reports as general medical or disability-related. The lower injury rate reported by Ferrara & Buckley (1996) compared to this study was most likely influenced by the subject pool and variety of sports and their relative risks, and a much larger sample of athletes.

Athletes with disabilities are not at a greater risk for injury than athletes without disabilities. Athletes with disabilities were injured at the same rate as athletes without disabilities when exposed to wheelchair basketball practices and games. Within the sport, the risk of injury was greater for a game situation than during a practice. While it has been reported that significant injuries are associated with training more days per week (Burnham, Higgins & Steadward, 1994), a similar risk based on exposure data was not evident with this study.

The majority of significant time loss from participation involved general medical and disability-related illnesses (> 7 days). Athletes reported rest and the use of medication for these reported illnesses. Participation time loss resulting from musculoskeletal injuries was minor (0-7 days). The upper extremity, in particular, the shoulder and hand were the most common and troublesome sites of injury in wheelchair basketball. A similar injury profile has been reported in other studies on the wheelchair athlete (Curtis & Dillon, 1985; McCormack et al., 1991; Burnham et al., 1994; Ferrara et al., 1992). Shoulder pain is a common and troublesome problem among wheelchair athletes. Overuse, impingement related to frequent overhead activity, arm weight-bearing, or muscle imbalance, and inflexibility have been attributed to the pathomechanics of shoulder disease (Burnham, Curtis & Reid, 1995). Prevention of shoulder problems should a goal of the athlete, coach and sport medicine professionals.

Attesting further to the troublesome nature of shoulder injuries among these athletes is the observation that professional medical care was utilized in 23% of the injury reports. Seventy seven percent of these injuries were not medically evaluated. Every athlete reported a supervising team coach. The coach has a responsibility to the athlete for appropriate medical care. It has been recognized that there is a need to educate the athlete and coach to prevent injury and to promote optimal performance and safer participation. Nevertheless, as early as the 1980's, Curtis and Dillon (1985), Ferrara and Davis (1990), Botvin-Madorsky and Curtis (1984) and Shephard (1988) have recognized that the importance of ongoing involvement of physicians and the sports medicine teams are crucial for assistance with the prevention, recognition, diagnosis and proper treatment of athletic injuries. In a prevention effort, the first published efficacy study on the effect of a standard exercise protocol on shoulder pain was conducted (Curtis, Tyner, Zachary, Lentell, Brink, Didyk, Gean, Hall, Hooper, Klos, Lesina & Pacillas, 1999). Subjects in this study who performed strengthening exercises for postural changes and related muscular imbalance decreased the intensity of shoulder pain in their functional daily activity. The effect of diminished shoulder pain by these subjects as reported in this largely self-administered intervention lends support to similar types of patient education efforts.

The sports surveillance system used in this present study relied on the athletes to self-report their injury experience. The choice of the athlete for data recorder has been previously reported in the literature in disability sport (Ferrara & Buckley, 1996). While the exposure and injury reporting forms were designed for the athlete, there are serious limitations when the athletes record data. There is a risk of under or over-reporting when there is a self-reporting mechansim of data collection (Wallace & Clark, 1988). Limitations have relied with the athlete who denied, concealed or failed to recognize her injury. While every athlete reported that a coach was present for practices and games, utilizing the coach as the data recorder was not viewed as a better option. The author felt that the athletes may not report an injury as it may in some way influence a coach's decision on team selection or playing time. The exposure forms validated the content of information collected and served as a cross reference with reported injury forms. With a large geographic distance and few team medical professionals involved, the athletes were the better option for data reporting.

Conclusion & Recommendations

An injury rate and a description of the types of injuries that occur to athletes participating in wheelchair basketball was provided. It has been recognized and reported that there are particular risk elements involved for athletes with or without disabilities in sport. Disability was not one of them, as the rate of injuries for athletes without disabilities was very similar to those athletes with disabilities. As the injuries occurred in games more frequently than in practices, proper warm-up, appropriate use of stretching, and injury management should be taken into account by athletes and coaches surrounding game play. Not only must athletes adequately prepare themselves for this level of game play, athletes must seek and access the appropriate medical care for assessment, diagnosis, and treatment for injuries. In turn, the involvement of professional sport medical care providers need to be encouraged to become involved in wheelchair basketball.

Regular contact and sport-specific and disability-specific medical monitoring programs would be ideal. Medical monitoring for one sport is different from that of another due to the great discrepancy in the demands of various sports. With knowledge of the demands of the sport, a specific medical monitoring program can be designed and implemented. Educating the athlete on health issues may occur in the one-on-one format as part of the regular medical assessments, or in a group setting during a training camp. Pertinent topics would vary from sport to sport, but should include information to educate the athlete and coach on injury prevention, promote optimal performance and safer participation.

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CHAPTER 5

Sport Medicine Care - An Athlete's Perspective: the sport injury experiences of the female athlete with a physical disability

Introduction

High performance sporting events for athletes with disabilities such as the Paralympic sport movement reflects a profound change in emphasis and perspective in the coaching, training and treatment of athletes. Despite the growth in disability sport and the accomplishments of the Paralympic movement, participation constraints in physical activities for people with disabilities have been discussed in the literature (Bedini & Henderson, 1994). Some of these reported constraints were inaccessible facilities, transportation problems, perceived lack of ability, lack of opportunities and lack of available information (Asch & fine, 1988; Coyle & McKinney, 1990; Fitness Canada, 1989; Kennedy, Smith & Austin, 1991; Olenik, Matthews & Steadward, 1995).

A further limiting factor to participation was the medical community who were slow to express support for athletes with disabilities, and in particular, wheelchair athletics (Corcoran, Goldman, Hoerner, Kling, Knuttgen, Marquis, McCann & Rossier, 1980). From the medical literature, it was shown that physical activity had a favourable effect on the progress of disease, reduced the susceptibility to infection, countered osteoporosis and positively impacted health behaviours (Shephard, 1988). Yet, fears for the health and safety of people with disabilities grew as the intensity of sporting events progressed. Sir Ludwig Guttmann, an advocate for disability sport, changed how the medical professionals viewed people with disabilities, but he too expressed concerns about distance racing and other endurance sports for athletes using wheelchairs. The medical profession as a whole was more receptive to the idea of specifically adapted physical activity with graded exercise as a means of attaining and maintaining good health than they were accepting of the concept of high performance sport. The primary objective was to prevent the patient's condition from complications, not to stimulate the patients to realize their physical potentials. The medical professionals' experience in treating sport-related injuries of able-bodied persons further convinced them that the person with a disability was at a greater risk of sustaining an injury which could lead only to further and perhaps permanent disability. Ryan (1984) reported that medical professionals had little knowledge of exercise physiology and tended to look on the disabled as having "weak constitutions", therefore, more vulnerable to illness or injury. The context of disability in the sport medicine care for athletes with disabilities must be considered. These athletes have had different experiences, deal with different issues, and may view sport differently than the able-bodied athlete. As quoted by one athlete, *"it's active living differently"*. The unique needs of people with disabilities influences choices and conditions regarding accessing medical care. Other researchers studying women with disabilities have also made similar conclusions about the necessity of choices and control of health care (Asch & Fine, 1988; Henderson & Bedini, 1995). For many of these athletes, the rehabilitation model may be the extent or breadth of their experience of medical care. The leap from a rehabilitation model where sport is used as a tool, to a sport model based on performance provides a different paradigm from which the athletes must operate.

Athletes with disabilities attach their own meaning relative to sport at the high performance level (Olenik et.al., 1995). At the Paralympic level, athletes view sport as being synonymous with the Olympic ideology. These athletes consider disability sport as "real" sport, and not a recreational event or a nice vacation (Olenik et al., 1995). Interest in sport medicine research increased in an attempt to meet the demands and the needs of these athletes by identifying training profiles and sport injuries, as well as equipment use and development. Still, within the literature, there remain questions about appropriate medical care, treatment and the return to participation after sport injuries for athletes with disabilities. Not only do athletes want to remain in their sport after a sport injury, many athletes with disabilities can not rest an injured limb due to the demands of daily life. Thus, producing great demands on those taking care of injured athletes.

Only recently, the sport medicine literature identified that similar injury types and frequencies for athletes with disabilities was at least comparable to that of the able-bodied athletic population (Ferrara, Buckley, McCann et al., 1992; Ferrara & Davis, 1990; Mangus, 1987; McCormick, 1985; Monahan, 1986). Despite the reported injuries among athletes with disabilities in the literature, the use of a sport medicine team was surprisingly uncommon (Botvin Madorsky & Curtis, 1984; Burnham, Newell, Steadward, 1991; Ferrara, Buckley, McCann, Limbird, Powell & Robl, 1992; Ferrara, Buckley, Messner, Benedict, 1992; Monahan, 1986; Laskowski, 1994). Typically, the sport medicine team becomes most important after an injury occurs for proper diagnosis and treatment which in turn avoids chronic and persistent problems. The goal of post-injury treatment is to restore the athlete to his/her sport. It has been documented that most of the reported injuries by athletes with disabilities were being self-treated without seeking professional assistance

(Curtis & Dillon,1985; Ferrara & Davis,1990; McCormack, Reid, Steadward, Syrotuik, 1991; Ferrara, Buckley, McCann et.al., 1992; Burnham, Higgins et.al.,1994). These researchers reported that for injuries which resulted in loss of participation time, athletes sought medical care only 50% of the time. Lack of medical professional care for the injured athlete has not been a concern solely for athletes with disabilities, but has also been reported among the able-bodied athletes. In one study, about one-half of injured recreational runners who sought medical care delayed their first visit for at least a week following the injury, and one-third delayed a medical consult for 2 weeks or more. More than half of the injured runners who sought care did so only when the injury had progressed to the point of actually limiting their running activity (Walter, 1988).

Attesting further to the more serious nature associated with seeking medical care was the finding that more than 50% of the reported sport injuries were identified as chronic, emphasizing the importance of the early interaction and follow-up care of the sport medical team with the injured athlete (Curtis & Dillon, 1985; Burnham et.al., 1991; Ferrara, Buckley, McCann et.al, Robl, 1992; Ferrara, Buckley, Messner et.al., 1992). Further, the delay in return to participation after a major injury has been reported to be longer as compared to the athlete without a disability. Ferrara & Davis (1990) in attempting to identify the time loss factor to sport participation due to injury in athletes using a wheelchair found an alarmingly high percentage (32%) of injuries classified as major (missing 22 days or more). It was speculated that the slow return to sport participation was due to delayed healing process as well as a conservative treatment approach. In a recent article by Burnham, Curtis & Reid (1995), the authors suggested why athletes with disabilities were reluctant to seek professional medical assistance for their sport injuries. Possible reasons include a perceived possible loss of independence, fear of being told to stop their activities, a previous negative experience during treatment or due to a lack of understanding by the medical professionals of the sport or the disability.

The current research in disability sport has identified a high number of athletes with chronic injuries, injured athletes who treat their own injuries and a significant amount of time loss to participation after a sport injury. The purpose of this research was to permit the injured athletes who participated in high performance disability sport to share the comparative impressions of their sport injury experiences and the pursuant medical care. A study of this nature puts the athlete at the center of the research as an active agent in the production of knowledge. This basic qualitative orientation to inquiry is particularly useful when the research question is concerned with the insiders' experiences in their own settings through narrative interviews and self-reports. The main contribution of qualitative research is the ability to discover and to generate theories utilizing the athletes' own experiences (Patton, 1990; Seidman, 1991).

Methods

Informant Selection

Informants for this study were 8 women with disabilities who participated in the Canadian Wheelchair Basketball Association during the 1996-97 season. Participation in this study was promoted via an announcement made at a national wheelchair basketball training camp. Informants were chosen through purposeful selection (Patton, 1990).

Selection was based first on the participant's willingness and apparent interest to be involved in the research project; and secondly, volunteer participants had to have sustained a sport injury within the last year prior to the interview. These criteria promoted self-selection by informants, rather than a random selection by the researcher (Seidman, 1991). The women varied in age, disability, years of disability, years of sport participation and geographic location as outlined in a descriptive statistics table (Table 5-1). All athletes had experienced at least one sport injury as a result of participating in wheelchair basketball during the previous year. Five of the athletes reported having an injury at the time of the interviews. The athletes were given an explanation of the study and made aware of the voluntary nature of participation. All of the athletes signed the consent form (Appendix J: Consent form) which outlined the importance of confidentiality, and which was approved by the Faculty of Physical Education and Recreation Research Ethics Committee at the University of Alberta.

Procedures and Analysis

Theoretical constructs from previous research on sport injury were used to develop the questions. Individual interviews consisted of open-ended questions designed to probe thematic areas centered around training and injury prevention, sport injury, injury care, access to care and the medical professionals involved (Appendix K: Question Framework).

Data were recorded in individual interviews, transcribed and prepared for a thematic analysis, according to the methods outlined in Seidman (1991). A thematic analysis is a descriptive process aimed to organize what is presented in the data, then to

TABLE 5-1: Descriptive Statistics of Informants

Demographic	Statistic
Sex	8 women
Age Range	21-38 years
Sport Status	8 competing at elite level from 3 - 12 years
Sport	Wheelchair Basketball
Geographic location	8 Canada 5 provinces 3 rural; 5 non-rural
Disability	3 with Spinal Cord Injury 1 with Cerebral Palsy 1 with Lower Limb Amputation 1 with Systemic L Erythematosus (SLE) 1 with Lower Extremity Paralysis
Years of Disability Range	10-33 years
Employment Status	2 Students 5 Employed 1 Not Employed

re-present a multitude of messages within a theme that seems to do justice to them all. Analysis consisted of the electronic cut and paste technique using word processing software (Wordperfect Version 5.1) outlined in Appendix L: Qualitative Analysis Using Wordperfect to organize and sort the data. The analysis reduced the data to a series of six major categories that emerged from the combined transcriptions to formulate the explanation of medical care for the injured athletes: perception of injury, defining sport injury, injury management, access to medical care, primary medical contact and self-treatment of injuries. In the interview, athletes also identified future recommendations for the sport medical professions and policy makers involved in disability sport. Each of these themes will be discussed with illustrative examples from the data.

Results

Perception of injury

All eight athletes reported incurring at least one sport injury within the last year at the time of the interview. All athletes listed their previous injuries as on-going problems, with the number of chronic injuries greater than acute injuries. Five injured athletes continued to participate in wheelchair basketball despite discomfort and pain. Pain during participation was recognized and understood by all athletes as part of the game in wheelchair basketball. All athletes reiterated and accepted that "*playing in pain is part of the game*", yet 7 of the 8 athletes reiterated no tolerance for those athletes who in fact were injured. One athlete strongly stated that:

> *It usually seems to be the same people, and then, so you think that when I get hurt, I'm not going to use that as an excuse, to take time off practice.*

For 2 of these athletes, pain stemming from their disability was managed day to day, and often, more pain from a sport injury was unmanageable. These athletes reported that they were unable to "*play through it*".

All athletes recognized that time together as a team was not frequent enough, and therefore, deemed precious. Only 5 of the 8 athletes reiterated the importance of their health and arriving at training camp prepared to participate unrestricted. One of these 7 athletes reported that the day-to-day aches and pains must be taken care of 365 days a year stating that "*it's not that something is injured, it's just maintenance*". In addition, 6 of the 8 athletes reported the external pressures of continual participation from coaches and peers. While the athletes felt the need to earn the respect of players and coaches as a contributing member of the team, all athletes felt that this respect did not transfer to the acknowledgment of an injury and the resultant request for rest. One athlete stated that she "*did not have a choice to rest or request time off, which is a result of being part of a team sport*". At times during the season, 4 of the 8 athletes reported that they "*questioned the commitment of the injured athlete and the seriousness of her injury*" that required time lost to participation. One athlete was quoted as saying that she wanted others to "*take a little responsibility in their own treatment*".

From a sport organization aspect, medical forms were completed before a major games event and mailed to the Canadian Paralympic Committee. These forms were identified by all athletes as generic, which focused on general physical health and would not be helpful to medical staff in terms of sport injury management. Although in-depth medical examinations were redone for each competition by the assigned team trainers, the medical personnel changed event by event so athletes never dealt with the same person. Relationships between these athletes and medical staff never evolved or developed. The lack of continuity of care and injury follow-up resulted in athletes arrival at the next camp or competition with unknown injuries and chronic injuries. For this team, mandatory training logs were completed by the athletes and submitted to the coaches. While this is an important aspect from a coaching perspective, medical and sport scientists have not utilized this information to target prevention and training adjustments for injured athletes.

Sport Injury Definition

How the athletes defined an injury influenced their decision making process for sport injury management. All athletes defined a major sport injury as something which interfered with or limited participation, identifying an injury as limites to optiaml performance. One athlete commented that "*a serious injury for me is if I can't play with the injury or the injury hindered my play*".

The perception of a major or serious injury for half of this group was one which required a medical consult. One athlete reported that she did not prefer to see a doctor unless it was really serious or the visit was a waste of time. Five of the eight athletes further defined a major or seriousness injury by what it was not, stating an injury is "*something that is not chronic*", or "*something that I had not had before*". These comments posed concern as the literature reports that the number of chronic injuries are more prevalent than acute injuries in disability sport (Ferrara et al., 1992; Burnham, Newell & Steadward, 1991). This finding may indicate that chronic injuries were not treated as seriously by these athletes as acute injuries.

Injuries which were a result of or caused by the athlete's disability were perceived as different from a sport injury, perhaps more accepted among peers. Disability-related injuries or illnesses were considered as major or serious for 7 of the 8 athletes. These injuries and illnesses were managed differently and treated by medical professionals more frequently than the sport-specific injuries.

Injury Management

Athletes managed their sport injuries in many different ways. Each athlete had her own protocol on how to care for her injury, which reflected a complex nature of help-seeking. Injury management was essentially learned based on the athlete's experience of what should be expected from their bodies and what others expected of them. When an athlete incurred an injury or illness, the consensus was that she would try to deal with it and manage on her own. Every athlete indicated that she was very knowledgeable about her own body and disability. But, only one athlete reported learned skills of self-monitoring, acquired from her medical rehabilitation which transferred over to sport injury care and prevention. Her injury management of "*not waiting until it gets injured or becomes chronic*" constituted self-assessment after participation, followed by ice and rest if needed. Ice treatment was seen as an effective part of the athletes' routine and a common tool for injury management among all athletes. This protocol was reported to have been learned from previous experiences, interaction with medical professionals and observing peers care for injuries.

For all 8 athletes, injuries were managed to minimize pain and return to participation quickly. One athlete stated that "*only I know what I am feeling, and need everyone to back off*". If pain still persisted, 7 of the 8 athletes resorted to over-the-counter medication for relief. If the athletes were not able to compete pain-free, only then would they seek medical assistance. Difficulties arose for two athletes who incurred an injury for the first time. These athletes had difficulty in trying to deal with their injury. One athlete commented on the difficulty with her management.

> "*I had to find a way to cope with what was going on and I really felt that it was important that I had control, so that I wanted to know what to do to have that control. So I learned those things, and I found people to teach me*".

Even though all athletes understood that sport was an environment where injuries will occur, two athletes stated that they were not concerned about sport injuries because injuries were out of their control.

> *I will be injured, with mostly minor injuries, and there was not much anybody could do about that. I am not going to stop playing the way I do, but I am concerned about further injuring it.*

Every athlete stated that she did not want to use injury as an excuse, and as a result, injuries were managed with the attitude of trying "*walk-it-off*", or to "*play through the pain*". While athletes reported that injury management was reinforced by the coaching staff, who would pass on injury prevention information or reiterate follow-up care of an injury, athletes still felt that their complaints were viewed or perceived by coaches and peers as a poor excuse and unacceptable.

Alluding to how important sport participation was for this group, 3 of the athletes actually denied their injuries, stating that if something hurt, they would avoid doing the activity that aggravated the injury. For example, these athletes who had shoulder pain, would avoid a type of throw when they passed the ball.

> *Even now, to this day, I can't throw a baseball pass - a long pass. It hurts at the front. Doesn't hurt when I'm shooting though. It's a weak point of my game.*
>
> *It would be alright for the first while, and as soon as I throw a pass like that and irritate it, and then it would start up again, so I more or less avoided those passes.*
>
> *With the rotator cuff stuff, and knowing when it happens, I have to back off, and not shoot so much, or change what my training is.*

The style of their game changed by modifying or altering their technique to meet the demands of the injury in their sport. The idea of accommodating style of play deserves further study.

The athletes were the stated authority, in 5 of the 8 interviews. "*We are athletes, we know what we can play through. I think that we are on the level where we should know when we can and can't*". This demonstration of independence combined with the pressures of participation make injury care challenging. This independence transcended to their injury management protocols. One athlete stated that "*the athlete in disability sport has to take a little responsibility in your own treatment, because I don't think enough people do that. It is the wave of the future*". Overall, most of the athletes realized the advantage of medical professional involvement for injury management and education but this did not seem to alter their injury management protocol. Time lost from participation for most athletes was minimal (0-7 days) but for a few athletes, time loss was significant

(21 days or more). All of these athletes did return to participate fully, but not necessarily pain-free.

Access to Medical Care

While the majority of the athletes were familiar on how to access the health care system, access seemed to be dependent on a number of factors for each athlete. The barriers to medical access explained by the athletes were divided into two categories: external barriers and internal barriers. External barriers were mentioned twice as frequently as internal barriers. The external barriers reported were no available care or not enough care, traveling for service and a perceived lack of time.

Athletes knew how to access medical care, which was described as being straight-forward and financially free for all athletes within their own health care system. Yet, even with this established process, only 1 athlete indicated that she had established a good relationship with her family physician.

> *I have a really good general practitioner who understands that I'm an athlete, and understands what that's all about, not just another injury.*

All 8 athletes continued to report difficulty in making appointments with a medical professional in a timely manner. Athletes' expectations of their care was expressed by one athlete who said:

> *I don't feel like I could, or should, get any special benefits or privileges because I'm part of an elite team. I feel that I should be able to call up a doctor and say that I've got a training camp coming up in two weeks, can you get me in right away. A lot of times, it's a week or more.*

Overall, athletes expressed difficulty in finding the appropriate or the right medical specialist, of who to see, and who would be available to them. "*As an athlete, no, I don't know what is available to me medically. I feel that it is the same as for anyone off the street*". Three athletes living in smaller communities expressed difficulty in finding qualified people or those with an expertise in sport, sport injuries, and their disability. Athletes were forced to travel to larger cities to see specialists or the professional of their choice.

> *After seeing the therapist in (big city) operate, she not only treated what was injured, but she went to all the other areas around which could be the problem. Which is something that my local therapist did not do. He only treated the shoulder, he didn't go and seek out other causes. I don't have that in my city, and I don't have the resources to go to (big city) to the sports medicine there. We don't have any, Canada team medical staff is the closest thing I have to sport therapy. It's kind of unfortunate we didn't have somebody that would take care of you when you have a complaint, and could assess the whole thing, my whole body, and try to figure out what's best.*

For another athlete, she considered living in a small town her choice to isolate her problem.

> *I live outside of the city, so for me to come to a certain clinic in the city is a pain in the butt. But, that is my choice to live out there, I guess.*

Further difficulties regarding access to medical professionals were reported when the athletes were travelling or away from their local area. Excluding emergency care, athletes reported that access to care varied with each training camp and competition. Every athlete stated that "*we don't know what is going to be available*". At training camps, athletes felt that there was no medical guidance, assistance or direction and that being in a strange place, most athletes will not venture to look for someone to care for their injuries. A veteran athlete commented that:

> *No, I was not aware of what was available here. I did not know what to expect. This is typical of camps in the past. We don't know what is going to be available, or who it is going to be.*

Another younger athlete reiterated a similar concern about the lack of qualified medical assistance. "*When we're on the road, especially at camps, there is 0, zero, people around to help*". At major competition events, such as the Paralympics, 7 of the 8 returning athletes were familiar with and knew how to access the medical clinics created for their sole use. This experience was reported to be both positive and negative. The system was in place for them, but the services of the doctors and therapists were not enough. Athletes found that the medical staff were in constant demand and very busy.

> *It's just too much hassle. It's still 200-300 athletes for the staff. When you are at a competition, schedules and meetings and practices, and I'm not going to stand in line.*

Therefore, not all athletes were able to utilize this service. As well, all athletes reported that the demands on their time at competition events prevented or limited time available to take care of their injuries. In addition, conflicting demands on time for 5 employed athletes who were taking time for travel and competitions left very few days for physician and therapy visits. Since medical staff were not part of the sport team, it became very difficult to fit schedule injury care above training, practices, travel and competitions.

> *It's good that some therapists treat for free. It's not just me, but everybody is not working now. We are all taking time off from work to do this, and volunteer, and follow through with our dream.*

Several internal barriers were discussed such as perceptions of when to access medical care, negative past experiences, independence and a sense of control. There was a perception that a physician or therapist visit was warranted for only major or serious injuries for half of these athletes. How the athletes defined sport injury may have affected their decision to access medical care. Past experiences with some medical professionals have left half of these athletes feeling empty or lost.

> *If I have a problem, I'll go deal with it. The doctor isn't going to do anything more than that, he'll tell me it's a sprain......and I could have just as easily put ice on it.*

Another athlete reported that a doctor prescribed complete rest after her injury. "*Just rest for 6 weeks. That was the first time I have ever hurt my neck, so I didn't know what to do, so I did nothing*". Most of the athletes felt that in certain instances, the medical professionals could not do any more than the athletes could for their injuries. One athlete summarized her experiences by stating why she would consult a professional. "*To see a medical professional, the injury would have to be something that I didn't know what it was, or that I knew that I couldn't treat myself*".

To a greater extent, one athlete felt the need to have control over her body, which she felt was often challenged by the medical professionals and their dictations of treatment regimes.

> *I really felt that it was important that I had control, so I wanted to know what to do to have that control. So I learned those things, and I found people to teach me, monitor me, and then I can dictate what it is that I have done and choose not to have done. Within my medical history, there is some certain things that probably are long term things that may go a certain way, and I try and direct that to how I choose. For a while, people were saying that you can't do this, or yes, you should do this, and choose this. I say no, I don't choose that route, I want to make my own decision here, and that's not my decision. I come to (therapist) for advice and*

> *your knowledge, but if I choose not to take that route, then you've got to let me do that.*

The athletes' strong independence and sense of control impacted, positively or negatively, their decision to seek medical care.

Primary Medical Contact

The athletes controlled the process, with a good deal of power simply by virtue of the fact that they could initiate the medical consultation. When the athletes did seek medical assistance, the general practitioner was the most utilized medical contact for both sport injuries and general health issues for 88% of these athletes. They had an expectation that the physician would do something about the problem. As previously stated, only 50% of this group sought medical consult for major or serious injuries. The other 50% listed various reasons why they would opt for medical help for minor injuries, which included persistent pain or for prescribed medications. Past experiences had left half of the athletes skeptical as the outcomes of a medical visit were reported as poor, except for one athlete. These athletes commented on past experiences:

> *The doctor isn't going to do anything more than that he'll tell me it's sprained.*
>
> *Unless it's a serious injury, I find it (to see a doctor) a waste of time, I don't go.*
>
> *His focus is always to just rest.*
>
> *Only if I need medication prescribed to get it better quicker would I visit a doctor.*
>
> *It is a waste of my time and energy sometimes.*

> *I have a GP who understands that I'm an athlete, and understands what that's all about, not just another injury.*

Athletes rarely used a sport medicine physician for sport-related injuries, preferring to utilize their family physician as the first medical contact. Only two athletes reported that they choose their physician based on what ails them. If the problem was disability related, these athletes consulted with their family physician and for sport-related injuries, they visited a sport medicine physician.

Sport therapy contact time was minimal for sport injuries. Only 2 athletes reported a successful relationship with physical therapist, from a financial aspect and performance outcome measure. For one athlete in particular, therapy allowed her to continue to participate pain-free. *"I maintain a healthy body by just doing some of the things therapists have told me to do in the past*". The other athletes stated that they didn't need any assistance nor saw the need to establish a relationship with a therapist.

The majority of athletes opted to discuss their symptoms with other athletes before seeking help. As a primary contact, athletes turned to their peers. Four of the athletes found teammates to be extremely helpful with advice that was free and easily accessible. More importantly, athletes felt they could relate to another athlete who was in a similar situation. Teammates were used as a primary resource at the time of injury as well as for chronic injury management. Interestingly, only one athlete explored other care besides traditional medicine.

All athletes ranked the coach as the last person that was consulted for care of their injuries. The coach was also the last person to become aware of an athlete's injury or illness, if the athlete had control of the situation. For these athletes, the injury-free appearance and ability to maintain a positive impression to the coach was paramount, which may have prevented effective communication and injury management.

Self-treatment of injuries

If an injury was not deemed serious enough by the athletes to seek medical assistance, their options were to stop participation or continue to play. In order to continue to play, the athletes managed their injury by self-treatment. Self-treating was reported by all the athletes as the only way to survive in sport. It was not only a way to cope with what was going on to her body, but gave the athlete a sense of control over her body. One athlete stated, *"I know for me, my body, what to look for"*. These athletes learned to self-treat by finding people to teach them, from the experience of treating previous injuries and from peer observations. These athletes wanted to make their own decisions, and sought out people who allowed them this luxury. "*I come to you for advice and your knowledge, but if I choose not to take that route, then you've got to let me do that*". Initially, some of these athletes may have used the medical professionals as a resource to educate or advise, but eventually, all athletes were put in a position of self-monitoring. *"I'm the one that's got to pay attention, and do the warm-ups, the exercises, the stretches, the icing and everything else"*. There were still questions from the athletes about their injuries as self-treatment is rarely monitored. "*I'm just doing some of the things physios have told me to do in the past. My problem is that when my injury feels better, I stop doing the treatment, and I'm not sure if that's right*". Regardless, athletes adapted to their own problems. They redefined their level of acceptable health, as reflected in their perception of an injury.

All athletes received information about sport injury and injury prevention at training camps or included in athlete packages from national sport organizations. These athletes felt that injury management was something that you learned from personal experience, not something that you were taught or read. As a result, this information was not used as an information source as intended by sporting organizations. Athletes reported that this material was not often read because topics may not have had a direct application to them.

Discussion

The athletes interviewed in this study identified athletic performance as the most important outcome of sport participation. In order to continue to participate with an injury, athletes played and competed in pain. As well, athletes often changed their style of play to accommodate injuries by avoiding the action or movement pattern that aggravated the injury. While injuries may result in athletes modifying their participation temporarily, compensatory actions are not the safest and most effective alternatives to full pain-free return to play. In order to try to minimize medically imposed limits to lost participation in sport, athletes primarily managed injuries by self-treatment. Athletes learned to self-treat primarily from past experiences. In turn, the depth of these injury experiences, or in one athlete's words, "*experiencing the same feeling*", probably affected their ability to self-treat and their performance outcome. The athletes learned to monitor their own injuries by remembering what made things worse or what made it better. Self-care is critical for the person with a disability (Williamson & Danaher,1978). If the decision is to self-treat sport injuries, athletes must have sufficient information about the efficacy and effectiveness of such treatment. Basic education will have to be a prime consideration before self-treatment is truly effective.

For all of the athletes, access and utilization of medical care for injury management was hindered by perceived barriers. External barriers were identified as lack of continuity of care, no available care, negative past experiences with the medical community and coaches. Athletes rarely established and developed an on-going relationship with the sport medical community. Medical care was inconsistent from event to event and considered very sporadic. Qualified medical staff were not always readily available at training or competition sites. When organized medical care was provided at major competitive events, a high rate of utilization (82%) by the athletes was demonstrated by Burnham and colleagues (1991). Athletes reported peers and then the family physician were the primary medical contacts for sport injuries. Ryan (1984) reported that most physicians have relatively little contact with persons with disabilities, not to mention athletes with disabilities. Athletes were skeptical of medical care as a result of past experiences and/or dealing with medical professionals who have little interest in exercise or sport (Ryan, 1984). For one athlete, a physician prescribed prolonged rest (4 weeks) for soft tissue injury management. While this treatment plan may have been warranted, the conventional rehabilitation team may have very different performance outcomes in mind compared with a sport medicine team. It is important to note that athletic performance, which is well above average functional performance, be considered by the health care porviders as the goal in treatment of injuries for these high performance athletes.

Conditioning and strengthening post-injury must go well beyond the strength, power, and endurance required for functional performance of activities of daily life (Botvin Madorsky & Curtis, 1984).

Athletes in rural communities reported a lack of available specialized services in their home communities which caused them to drive long distances to find the appropriate care. Sample & Darragh (1998) who studied perceptions of care access of women following brain injury reported that poor experiences with local service providers and a lack of local resources required travel to larger cities to seek appropriate services.

Coaches were not involved in individual injury management, despite monitoring training logs and collection of medical forms from the athletes. The coaches were identified as the last person that was consulted for care of their injuries or to even become aware of an athlete's injury or illness status, if the athlete had control of the situation. Injuries were identified as an athlete or an individual problem, not a team problem. Each athlete reported that she was responsible for her injuries and injury management. For example, athletes reiterated many times the need for rest from practice or avoiding certain drills with minimal support received from the coaches or their peers, perhaps reinforcing the lack of communication on injuries with the coaching staff. In an interview, one athlete even suggested a forum for discussion in a team setting to lay the groundwork for such requests so participants may feel that their own problems were considered significant and important (Sample & Darragh, 1998). People's concerns with how others perceive and evaluate them can lead to behaviors that increase the risk of illness and injury (Leary, Tchividjian & Kraxberger, 1994).

A central theme in both medical and health psychology is how people make sense of their symptoms. Internal barriers in accessing medical care identified by the athletes included perception of injury, when to access care, negative past experiences, perceived loss of independence and sense of control. The context of disability in the sport medicine care for athletes with disabilities may influence choices and conditions regarding accessing and utilization of medical care. Other researchers studying women with disabilities have also made similar conclusions about the necessity of choices and control in health care (Asch & Fine, 1988; Henderson & Bedini, 1995). Disability status has been recognized as an individual difference factor posited to affect competitive orientation. Sport participation may be a means through which individuals with disabilities can reintegrate, regain competence or be empowered (Page, O'Connor & Wayda, 2000). At the same time, it has also been suggested that perceived competence and feelings of control can be influenced by the incidence of disability (Sherrill, 1998). The loss of internal control over one's environment has also been identified in athletes who have been injured (Hardy, 1992). Athlete's perception of injury can act as an internal barrier to medical care access and utilization. Chronic injuries were not perceived by the athletes as serious injuries that required medical attention. If the onset of an injury was traumatic or acute, help was sought immediately. On the other hand, insidiously developing or chronic conditions allowed sufferers opportunities for the exchange of ideas and self-treatment. The combination of a high frequency of chronic injuries among athletes in disability sport (Burnham et al., 1991; Ferrara et al., 1992) with a continued lack of professional medical care for these chronic injuries, creates a concern for the future sports participation and diminished capacity for daily living activities of these athletes. In addition, athletes perceived sport injuries as an accepted part of the game. Athletes who incurred injuries felt that they were the authority to manage injuries simply because they had suffered a lot of them. The athlete decided on what was her acceptable health, not the coach, teammate, doctor, therapist, or any combination of this group. Levine and Reicher (1996) proposed that physical symptoms are evaluated, not against pre-existing illness representations, but by reference to their impact on situationally salient identities. This is the sort of difference that is implied between doing nothing and deciding to see a doctor. Athletes may prefer the physical discomfort of continuing sport in the presence of injury to the emotional discomfort of depression or tension which may accompany sport cessation (Smith et al., 1990).

For the injured athletes who accessed health services, adherence to treatment directions by medical professionals varied. One athlete is this study did not question a physician's prescription of 4 weeks rest, that resulted in an unnecessary lengthy absence from sport participation. Findings by Stewart (1983) showed that although women may get more information from a physician than men, they are less likely to challenge or disagree with the physician's diagnosis and recommendation for treatment. The foregoing can have a serious impact on the ability of women to access the most appropriate sport medical professionals for their progressive treatment. For the most part, athletes did not access medical care. This may be attributed to a denial to seek help and a determination not to give in to weakness (Smith et.al., 1990). In addition, athletes may have felt discriminated against by their peers for injuries, which may also inhibit them from seeking help. Perhaps the "tough it out" approach is still very pervasive in sports.

To strengthen the medical resources available to athletes, sport physicians and athletic therapists need to be involved. Sound principles of preparation for participation, injury prevention, early recognition and intervention with established training programs need to be made available and accessible. Essentially, more involvement by competent sport medical professionals with this population will be of benefit to these athletes.

Limitations

There are several limitations to this study. First, generalizability from interviews may be limited. The data for this study was collected from a group of high performance female athletes. Thus, the results cannot be generalized directly to all women with disabilities. Another limitation of the methodology is selection bias. Participants agreed to participate because they thought the location and time were convenient, thus omitting those women who met the criteria but were not in attendance at the training camp. Despite these limitations, qualitative research is still a viable way to gain information that is not easily obtained through quantitative methods and remains a good way to gain preliminary information about the patterns of medical care in this population (Krueger, 1994). This study does not provide definitive answers, but illuminates the issues that influenced sport injury management for eight female athletes with disabilities.

Conclusions and Implications

This exploratory qualitative study was descriptive in nature, with only a few previous studies conducted on the medical care of and for athletes with disabilities to draw from. Sports medicine for athletes with disabilities is an evolving process. Only recently, during the last 15 years, has the research efforts developed a focus of interest and activity within this sports medicine community (Botvin Madorsky & Curtis, 1984; Curtis, 1993; Mangus, 1987; Monahan, 1986; Ryan, 1984). In this study, female athletes with disabilities found benefits of medical professionals, but overall, did not value the services they received. Athletic performance was the desired outcome of sport participation. Although sport injuries did alter participation, these injuries rarely kept athletes from returning to participation. Athletes were self-treating the majority of their sport injuries by peer consultations and transferring skills learned from previous experiences. Accordingly, athletes continued to participate in sport with chronic injuries, with pain or tried to avoid actions or activities that created pain. However, this study provided evidence that perceived barriers exist in accessing and utilizing the current medical or health care system maximally. There is a sense that athletes are unaware of how to interact with the medical system. To have appropriate conditions for athletes to interact with the sport medicine community to occur, constraints need to be addressed. Some of the barriers may not be able to be changed secondary to cost, efficiency and logistics. Other barriers, perceived or real, could be affected through education, policy, and continued research.

Education

There is a need to educate the athletes, coaches and sport medical professionals on injury management. It was documented that athletes have difficulty with internal barriers, but athletes also must continue to demand appropriate medical care, demand medical team staffing, and become an active partner in their medical care. Responsibility is not restricted to the athletes. By receiving comprehensive and objective information about care options, athletes are allowed to make informed choices about their sport injury rehabilitation. While each athlete must be responsible for her own decisions and resultant performance outcomes, it is, however, the responsibility of the sport medical team to facilitate continual improvement of these services to make sure that all individuals are able to access and benefit from current scientific and sport medical knowledge. More specifically, the sport medical model has to be sensitive to the athlete with a disability. The medical community will have to continue to communicate and share information, understand the psychosocial dynamics accompanying high performance disability sport and to appreciate the significance of the injury to the athlete (Smith et.al., 1990). Finally, there is a need to educate coaches, who athletes feel exert a major external pressure to the athletes. One of the responsibilities of a coach is to oversee the athletic health care needs of team members. Some coaches may lack knowledge about medical resources available or injury prevention strategies. This information should be included in coaches' training, further supporting the need for credentialing procedures for coaches working with high performance athletes.

Policy

Members of the sports medicine team should frequently interact with the injured athletes in the physical and psychological post-injury rehabilitation, thereby facilitating care and goals. The sports medicine team and the injured athlete must work together to return to sport. Communication between the coach, the athlete and the sports medicine team is crucial so that realistic performance goals can be set and the athlete can be eased back into practice and competition. Policies to identify and implement a consistent system of care for the individual athlete and for the athlete as a member of a sport team appears to be crucial. Additionally, identified barriers to access and utilize medical care may help in the planning and implementation of appropriate medical care services with teams or major competitions. Athletes must receive training and conditioning information from the most reliable sources which will enable them to compete at safe and optimal levels.

Research

Athletes with disabilities are an under-researched area of study (Henderson & Bedini, 1995; Sherrill, 1990). Research on disability and medical care outside of the rehabilitation setting is sparse. Further insight into the evaluation of the impact of injury on the athlete, the athlete's interpretation of the injury, the emotional responses of the athlete to injury and the behavioural consequences (psychophysiological model) would assist in increasing medical care access and utilization (Wiese, Weiss, Yukelson, 1989). Women, in particular, compose a small percentage of athletes involved in disability sport (Olenik, 1998), have faced restricted access to health care in general (Sample & Darragh, 1998) and receive less from public income support programs than do men with a disability (Asch & Fine, 1988). The women in this study reported challenges that were similar to those faced by women in general while accessing health care (Bendini & Henderson, 1994). Future research should focus on gender specific issues related to sports medicine as well to improve the prevention, treatment and rehabilitation of sport injuries for athletes with disabilities.

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Chapter 6

Conclusions and Implications

There are no great people, rather,
there are great challenges that people have to meet
1994 Paralympian athlete

The purpose of this dissertation was to provide descriptive statistical information and qualitative data for athletes, coaches and sport medical professionals on the risks of sport-related injuries to athletes participating in disability sport and the management of these injuries. The objective of this thesis was to attempt to answer the following three questions as outlined in the introduction:

1. To determine the risk of injury during participation in specific disability sports (ie., ice sledge hockey and wheelchair basketball);
2. To determine the time-loss from participation in sport resulting from sport injury;
3. To determine the injury management of sports injuries for athletes with disabilities.

Conclusions

1. Sports injuries reported by participants in disability sport were sport-specific. The type of sport was determined to be a predictor for sport injury. The risk of injury during participation in specific disability sports was calculated as follows:
    - ☐ Alpine skiing: 9 injuries/1000 athlete-exposures (AE)
    - ☐ Nordic skiing: 3.2 injuries/1000 AE

- ❑ Ice sledge hockey: 4.6 injuries/1000 AE in the Paralympic study and 4.9 injuries/1000 AE reported from the Canadian ice sledge hockey study with the reported injury risk in game play (8.7 injuries/1000 AE) greater than during practices (3.4 injuries/1000 AE).
- ❑ Wheelchair basketball: 12.3 injuries/1000 AE. Sport injury risk for games was 17.2 injuries/1000 AE and practices was 8.7 injuries/1000 AE.
- ❑ The types and locations of injuries were specific to the sport and the style of participation. Athletes in the sport of alpine skiing incurred injuries to the lower extremity, specifically the thigh and knee. These injuries were primarily acute in nature. Athletes participating in nordic skiing and ice sledge hockey (sit-down participation style) reported chronic injuries to the upper extremity, primarily located to the shoulder. Athletes participating in wheelchair basketball reported mainly acute injuries (95%) to the hand, fingers, shoulder and spine.

2. The time-loss from participation in sport resulting from musculoskeletal sport injuries was minor (< 7 days) to moderate (7 days - 21 days), varying with the type of sport.
    - ❑ For ice sledge hockey, the average time loss from activity was moderate (17 days). Injuries to the hands, fingers and shoulders accounted for both minor and moderate time loss injuries.
    - ❑ Time loss injuries for wheelchair basketball athletes were minor (< 7 days).

Injuries to the hand and fingers accounted for minor days lost to participation.

❑ General medical illnesses and disability-related illness were minor contributors to time lost to sport participation. In the 3 epidemiological studies, 50% of the participants reported disability-related illness or problems including pressure sores, thermal regulation, stump and prosthetic problems. In addition, athletes identified disability-related issues which affected participation which included lack of adaptive sport equipment and inaccessible sport venues.

3. Data collected on sport injury management revealed many different ways athletes cared for and managed their sport injuries. This reflected the complex nature of help-seeking.

❑ 27% of the Paralympic winter sport athletes did not seek medical attention for their sport injuries. Of those athletes that did seek professional health care (73%), the physician was the primary care giver.

❑ Data from the injury forms of the second study on the ice sledge hockey players documented 67% of the sport injuries were medically evaluated. Emergency care physicians were the primary health provider. The remaining 33% of the reported injuries were self-treated.

❑ The prospective wheelchair basketball study revealed 70% of the injuries were not medically evaluated, but were self-treated by the injured athlete. When help was sought, physicians were the primary care givers.

- ☐ Issues with access and utilization of medical care involved external barriers (e.g. available care, continuity of care, coaches and negative past experiences with the medical community) and internal barriers (e.g. perception of injury, when to access care, negative past experiences, perceived loss of independence and sense of control).

The studies in this dissertation demonstrated that athletic performance was the desired outcome for these athletes as they participated in disability sports. It was also demonstrated that most of these reported injuries were sport-related, not disability-related. Although sport injuries resulted in athletes modifying, altering or temporarily stopping their activity, these injuries did not keep athletes from returning to high performance sport participation. Athletes did not seek care for the majority of sports injuries incurred, but instead self-treated their sport injuries by peer consultations or transferred skills learned from past experiences. Accordingly, athletes continued to participate in sport with chronic injuries, in pain or avoided actions or activities that caused pain. However, the last study provided evidence that athletes either displayed a reluctance to approach appropriate medical staff or had difficulties in accessing appropriate medical attention. Perceived internal and external barriers existed in both accessing and utilizing the medical care system for sport injuries.

Implications

In order to achieve the desired outcome and to have appropriate conditions for athletes to interact with sport medical professionals, constraints need to be addressed. Some of the barriers or problems identified within this thesis cannot be changed secondary to cost, efficiency and logistics. Other barriers, whether perceived or real, could be affected through education and continued research. The implications of these findings for theory and for practice and policy will be briefly presented.

Theory

When the breadth of sport medicine literature is surveyed, one views an evolution of a) identifying and describing the types and locations of injuries that are occurring in specific sports, b) proceeding to determine how to treat these injuries and c) what can be done to prevent these sports injuries. While sport has gained acceptance as an effective therapeutic exercise for people with disabilities, the sport medicine research in this area is currently in the first stage - identifying and describing sport injuries in various disability sports (the epidemiology of sports injuries). Further studies are required to ensure that high performance sport does not result in harmful or injurious activity or adversely affect disability. Epidemiological research is appropriate for this period in the evolution of sport medical care for athletes in disability sport. Not only is epidemiological sport medicine research critical to understanding sport injuries and the risks for injury, there are advantages to look at injuries from a traditional framework. It has been reported that there are particular risk elements involved for athletes with disabilities in sport such as dysreflexia or thermoregulatory problems (Curtis & Gailey, 1996; Davis & Ferrara, 1995). As researchers proceed to identify and describe sport injuries, various investigative procedures have utility for examining particular cause-effect propositions. Even though the introduction of epidemiological research in disability sport is just beginning, it has already changed the focus of sport medical care for athletes with disabilities. The results from this dissertation indicated that the majority of reported injuries were sport-related, thereby shifting the emphasis away from disability.

Sport injury research in disability sport reveals methods of data collection that have been simplistic, such as simple frequency counts to demonstrate statistics. As stated by Buckley (1988), the sport setting is unique in terms of the complexity of variables associated with an injury. The studies in this dissertation examined variables to demonstrate relevant interactions between an item (hypothesized causal factor) and a variable (injured or non-injured), using more sophisticated designs such as prospective cohort studies and statistical applications such as logistical regression. To confound these variables, researchers in disability sport also must address issues of small sample size, limited athlete exposures per sport, a large geographic distribution and the non-homogeneity of disability. Despite these limitations, research in this area is just beginning to include exposure data and level of participation comparisons. These comparisons have been done primarily with retrospective data. The prospective design for study of injury is generally more difficult to execute than a retrospective method or a case series method because of the necessity to establish the cohort and then follow its members for a period of time to record their injury experiences. According to Smith, Stuart, Wiese-Bjornstal and Gunnon (1997), studies are strongest when 1) the injury definition is suited to the sport studied, 2) injuries are expressed in terms of players at risk for injury, 3) injuries are diagnosed by qualified health care professionals, 4) pre-existing conditions are known and 5) severity of injury (based on time lost to sport) are all documented. Care was taken to meet these criteria in the studies of this dissertation, except for point number three (injuries diagnosed by qualified health care professionals). Most athletes self-treated their own injuries. In the three epidemiological studies of this dissertation, the athlete was designated as the primary recorder of the data. Limitations using self-reporting mechanism of data collection have been identified in the literature by Wallace & Clark (1988) which risk under or over-reporting. Future studies should attempt to include qualified health care professionals in data collection to develop meaningful quantitative measures of injury to further explore this cause-effect relationship of sport injuries.

There are only a few studies on prevention implications which suggest methods to enhance athletic performance in the sport activity with reduced risk for injury (Bloomquist, 1986; Curtis & Gailey, 1996; Ferrara, Buckley, McCann, Limbird, Powell & Robl, 1992; Laskowski, 1994; Mangus, 1987; Shephard, 1988). For example, athlete injury profiles in the studies in this dissertation identify the shoulder as the most affected site. Prevention and treatment of shoulder rotator cuff problems in wheelchair athletes include adequate rest and recovery time, inflammation reduction, minimizing shoulder impingement positions, strengthening and stretching shoulder structures (Burnham, Curtis & Reid, 1995). There is one current research study that examines the efficacy of a prevention program on the effect of a standard exercise protocol on shoulder pain (Curtis, Tyner, Zachary, Lentell, Brink, Didyk, Gean, Hall, Hooper, Klos, Lesina & Pacillas, 1999). Subjects in this study who performed strengthening exercises for postural changes and related muscular imbalance decreased the intensity of shoulder pain in their functional daily activity. The effect of diminished shoulder pain by these subjects as reported in this largely self-administered intervention lends support to similar types of patient education efforts.

While there is a need for injury prevention research, there are some difficulties and challenges to validating these programs as the athlete, the athlete's disability, the sport equipment and the environment need to be considered, all of which are factors that are difficult to control or re-create. Identifying risk factors in specific sports and proceeding how to treat these injuries are costly in terms of money and time, as it takes more than one season to learn whether subsequent injury patterns proved the purported solution to have been a solution. Additionally, quantitative research assumes homogeneity, yet disability is heterogeneous. As a group, it may seem unrealistic to profile injuries and injury risks for a group of athletes who participate in a downhill skiing event under 12 different classifications. As an individual, an athlete can experience rapid fluctuations in physiological parameters often measured in quantitative sport medicine research. For example, athletes with high spinal cord injuries can experience autonomic dysreflexia within seconds of a painful stimulus below their spinal cord lesion level that can profoundly affect heart rate, blood pressure and sport performance (Burnham, Wheeler, Bhambhani, Belanger, Eriksson & Steadward, 1994). There is a role for different research methodologies to address issues in sports medicine. Quantitative research has continued to contribute greatly to advances in medical science, but other research models such as case studies, single-subject designs and qualitative research may have continuing relevance.

Athletes with disabilities are an under-researched area of study (Henderson & Bedini, 1995; Sherrill, Gench, Hinson, Gilstrap, Richir, & Mastro, 1990). Research on disability and medical care outside of the rehabilitation setting is sparse. As sport type was identified as a risk factor for injury, future research needs to identify risk factors in specific sports. Women, in particular, compose a small percentage of high performance athletes involved in disability sport (Olenik, 1998). The female athletes in the last study reported challenges that were similar to those faced by women in general while accessing health care (Asch & Fine, 1988; Bendini & Henderson, 1994; Sample & Darragh, 1998). Future research should focus on specific issues related to sports medicine to improve the prevention, treatment and rehabilitation of sport injuries for athletes with disabilities.

Practice & Policy

The first step in promoting healthy behavior is to understand why people do not take adequate care of their health. Discussion around this question has focused on the athlete's perceptions of the severity of the problem, their expectations regarding whether self-treatment will improve their health, or their interpersonal motives that affect health-related behaviors. Such processes are sometimes included in cognitively oriented models of health behavior as factors related to health values, outcomes or barriers (Leary, Tchividjian, Kraxberger, 1994). These models of health behavior have rarely been studied among athletes with disabilities. Yet, research evidence suggests that these behaviors have implications for understanding, preventing and treating a diverse array of health problems. This area has been largely neglected by health researchers, practitioners and deserves greater attention. The big question for health researchers and professionals is how to lead athletes to pay more attention to their health.

The sport medical professionals and coaches have to be sensitive to and try to understand the interaction of the athlete's personal style and goals, abilities, support mechanisms and the athlete's perceptions. In particular, the medical community (physicians and therapists) needs to embrace athletes, whose goal is to return to sport participation. Medical professionals sometimes failed to promote sport and physical activity as an option because they may not have been aware of opportunities available, lack an understanding of sport and the person's capabilities, or may have been overprotective. As athletes with disabilities change paradigms from a rehabilitation to a sport context, the roles and responsibilities of the medical professionals also change to concentrate their efforts to enhance healthy athletic performance by providing expertise and counsel in the area of sports science and medical matters and bringing issues from the sports science and medical area of operations to committees, administrators and researchers (International Paralympic Committee Task Force Report, 1996). The medical professionals who understand sport and sport rehabilitation are better able to present this information to the athlete and deliver this service. To provide this educational information, it may require curriculum changes in sport medicine, continuing education credits in post-degree program maintenance or revisiting another "VISTA" style conference which allowed athletes, sport scientists, coaches and the medical profession to interact. The expectations of medical care for athletes with disabilities are no different than for the athlete without disabilities. The needs of these participants may vary due to their individual physiology, psychology and sport technology. These needs should be met by capable and experienced sport medical professionals familiar with the underlying medical condition of the athlete with a disability so athletes do not revert back to the rehabilitation model for sport injury care. These athletes are vulnerable to specific injuries and illnesses related to their disability such as autonomic dysreflexia, hyper- and hypothermia, hypertension or pressure sores (Curtis & Gailey, 1996; Davis & Ferrara, 1995; Mangus, 1987; Shephard, 1988). Regardless, an aggressive approach should be taken by the sport medical profession for the management and treatment of sport injuries for these athletes. These principles and practices can be developed and used in a high performance centre type model to incorporate many professional members of the sport team.

Particular attention must be extended to the athletes who self-treat post-injury. Self-treatment is truly the first level of medical care as a form of information-seeking which serves to either help the athlete make sense of the symptom, decide what to do about it, or rationalize an apparent failure of the remedy being used (Williamson & Danaher, 1978). Those with medical knowledge will always be a desirable source of advice. Issues surrounding self-treatment have implications for health promotion strategies by the sport medical professionals. For example, a sports medical assessment for athletes with disabilities may contribute to medical professionals' and athletes' awareness of the physical needs of high performance athletes, contribute to the prevention of sport injuries and to prevent secondary disabilities (Jacob & Hutzler, 1998).

There is a need to educate the coaches who were identified as a major external pressure to the athletes. One of the responsibilities of a coach is to oversee the athletic health care needs of team members. Some coaches may lack knowledge about medical resources available, injury prevention strategies or training and conditioning information. This information should be included in coaches' training, further supporting the need for credentialing procedures for coaches working with high performance athletes. Further, athletes would benefit from coaching resources to coordinate care, organize clinicians and facilitate goals. The roles of the coaches and referees/officials need to be identified, as they may play a different role in disability sport. They can play a more pro-active role in changing rules and protective equipment for the safe participation of athletes.

Responsibility for medical care is not restricted to the sport medical professionals and coaches, but is a shared responsibility to include athletes. By receiving comprehensive and objective information about care options, athletes would be able to make informed choices about their sport injury rehabilitation. Athletes must not only recognize the need to seek help but must also understand why to seek help, and further, know what services are available. For some athletes, perceptions and barriers interfered with obtaining adequate medical care. While each athlete must be accountable for his/her own decision, it is, however, the responsibility of the coaches and the sport medical team to facilitate continual improvement of these services to make sure that all individuals are able to access and benefit from these services. Athletes must also continue to demand services, appropriate medical care, medical team staffing and become an active partner in their medical care.

Closing Remarks

The intention of this dissertation was to provide readers with information about another setting that requires the skills and competencies of sport medical professionals and to encourage many sport therapists to become involved in the worthwhile endeavor of providing professional services to athletes with disabilities. These chapters will hopefully sensitize health care professionals to the need to consider both medical and situational factors in assessing the impact of disability in sport at recreational, competitive and high performance levels. It was the intent of the author to encourage students and practitioners in the health care disciplines and disability sport organizations to examine critically their assumptions about sports participation of athletes with disabilities. By addressing these sport medical issues confronting athletes in disability sport, future researchers and readers will be assisted in appreciating the breadth and scope of the sports medical care required by these athletes.

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APPENDIXES

APPENDIX A

Paralympic Athlete Questionnaire

ATHLETE QUESTIONNAIRE

PART I

ATHLETE NUMBER: ____

DA/MOS/YEAR

AGE ___ Date of Birth _/_/__ M _ F _

City/Province ______________ Phone _____ HT ___ WT ____

List any medications presently taking ______________________________

List any Nutritional Supplements presently taking ______________________
(vitamins, proteins)

List the Sport(s) you are competing in at the Paralympics.

a. Nordic Skiing
_ 2.5 km cl. _ 5 km cl. _ 10 km cl. _ 15 km cl.
_ 5 km fr. _ 10 km fr. _ 20 km cl. _ relay
_ biathlon
_____stand-up
sit-down

b. Alpine Skiing
_ downhill _ super G _ Giant slalom _ Slalom
____ stand-up
_____sit-down

c. Ice sledge racing Event ________________

d. Ice Hockey Position ________________

Date of onset of Disability (month/year). ____/_____ / Birth:

Type of Disability.
_ Congenital a. disease b. deformity

_ Acquired a. disease
b. accident: trauma industrial MVA gunshot other ____

Specify your disability.

a. SCI Level ____
b. Visually Impaired
c. Spina Bifida
d. Amputee
e. Muscular Dystrophy
f. Cerebral Palsy
g. Multiple Sclerosis
h. Polio
i. congenital deformity
j. Osteoarthritis
k. Brain trauma
l. Vascular disease
m. stroke
n. Blind
o. Other ___________

Classification ______________________

How many years have you participated in sport?

A. Competitive winter sport years
b. Recreational winter sport years
c. Competitive summer sport years
d. Recreational summer sport years

List the sports:

Did you compete in sport prior to your disability (if applicable)?

YES _ NO _
If yes, list your sport involvement:

____

____

Do you have a:

Daily COACH No _ Yes _, Certified? __ Level? __
Regular PHYSICIAN No _ Yes _
Regular THERAPIST No _ Yes _
Trainer No _ Yes _
Massage No _ Yes _
Psychologist No _ Yes _

How many years have you had lessons in your sport? _____ years

List the Competitions or Races during the 1993/94 season that you participated in prior to the Paralympics.

____

____

____

What is the average number of time (hours) in a practice session in training for your sport? Hours

What is the average number of **days per week** that you spent in training this season in each month?

September __ October __ November __ December __
January __ February __ March __

What is the average number of **weeks per month** that you spent in training this season?

September __ October __ November __ December __
January __ February __ March __

FOR THE FOLLOWING QUESTION, STATE THE NUMBER OF **DAYS PER WEEK** YOU PARTICIPATED IN THE SPECIFIC TRAINING PRACTICES FOR EACH MONTH FROM SEPTEMBER 1993 TO MARCH 1994:

	Sept	Oct	Nov	Dec	Jan	Feb	March
1. Strength / Weight Training	__	__	__	__	__	__	__
2. Aerobic Training	__	__	__	__	__	__	__
3. Anaerobic Training	__	__	__	__	__	__	__
4. Flexibility /Stretching	__	__	__	__	__	__	__

Do You Warm-up before each PRACTICE?
NO _ YES _, Describe ______________________________

Do You Warm-up before each COMPETITION?
NO _ YES _, Describe ______________________________

Do You Cool-down after PRACTICE?
NO _ YES _, Describe ______________________________

Do You Cool-down after COMPETITION?
NO _ YES _, Describe ______________________________

List the type of Adaptive Equipment that you use (model, method)

____

____

Have you made any MODIFICATIONS to your EQUIPMENT (personal, professional)

____

____

What is the Length of Ski per EVENT (if applicable)

__________ Event __________

__________ Event __________

__________ Event __________

What is the type of bindings on your skis? (model) ________________

Do you use PROSTHETIC DEVICES?
NO _ YES _, LIST ______________________________

Do you wear any protective gear during participation in your sport? (circle one or more)

a. gloves	b. helmet	c. face mask	d. elbow pads
e. braces	f. knee pads	g. shoulder pads	h. neck protector
i. tape/wrap	j. straps	k. eye protection	

l. other __________________________

Are Pressure Sores a Problem in sport participation? (if applicable)
NO _ YES _, LIST __________________________

Do you have Stump Problems in sport participation? (if applicable)
NO _ YES _, LIST __________________________

Has THERMAL HEAT LOSS ever been a problem during participation in sport?

NO _ YES _, Explain __________________________

____

Have you ever received any information on INJURY PREVENTION?

NO __ YES __, LIST Information: ______________________________

____

Identify any disability-related problems that have prevented you from participation in sport. (circle one or more and specify)

a. Medical problems related to the disability
b. Lack of equipment
c. Lack of support personnel
d. Other ______________
e. classification
f. none

Specify ____

Circle the types of sports-related educational programs in which you would like to take part in or receive more information on.

a. weight training
b. conditioning
c. sport performance
d. sport skills
e. nutrition / diet
f. motivation
g. sport psychology
h. injury prevention
i. equipment
k. other ____

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. LIST ALL OTHER SPORTS OR ACTIVITY INVOLVEMENT IN THE LAST 12 MONTHS:

____

____

____

2. LIST ANY PRESENT MEDICAL CONDITIONS THAT YOU FEEL MAY BE RELATED TO YOUR SPORT:

____

____

3. DID YOU EXPERIENCE ANY INJURY IN THE PREVIOUS 6 MONTHS?

Yes No

If yes, complete the next section: **PART 2 - Injury Reporting Form**

PART 2: INJURY REPORTING FORM

Complete a NEW FORM for each injury that occurred over the past 6 months:

A SPORT INJURY IS DEFINED AS:

> **ANY TRAUMA, DAMAGE OR ILLNESS THAT OCCURRED DURING ANY PRACTICE, TRAINING, OR COMPETITION SESSION IN THE 6 MONTHS PRIOR TO THE GAMES WHICH RESULTED IN MEDICAL CARE OR THE CESSATION, LIMITATION, OR MODIFICATION OF YOUR PARTICIPATION IN THE SPORT FOR AT LEAST 24 HOURS.**

PLEASE CIRCLE THE APPROPRIATE ANSWERS ON THIS FORM AND COMPLETE THE QUESTIONS AS THEY RELATE TO YOUR SPORTS INJURY. YOU MAY CHOOSE MORE THAN ONE ANSWER.

ATHLETE NUMBER: _______ DATE OF INJURY (mos/year) _______

What was the TYPE of injury?

a. Abscess
b. Abrasion
c. Autonomic Dysreflexia
d. Avulsion
e. Blister
f. Burn 1st deg
g. Burn 2nd deg
h. Burn 3rd deg
i. Bursitis
j. Calcification
k. Callus
l. Contusion
m. Concuss 1st
n. Concuss 2nd
o. Concuss 3rd
p. Corn
q. Dental
r. Dislocation
s. Edema
t. Embolism
u. Fracture
v. Haemorrhage
w. Infection
x. Inflammation
y. Laceration
z. Muscle Cramp
aa. Occlusion
bb. Rash
cc. Pressure sore
dd. Seizure
ee. Spasm
ff. Sprain
gg. Strain
hh. Subluxation
ii. Tendonitis
jj. Tenosynovitis
kk. Temperature-related
ll. Other ____________________

Where was the LOCATION of the injury? Side: left right

a. Cervical Spine
b. Thoracic Spine
c. Lumbar Spine
d. Sacral Spine
e. Head
f. Face
g. Neck
h. Shoulder
i. Upper arm
j. Elbow
k. Forearm
l. Wrist
m. Hand
n. Finger
o. Chest
p. Abdomen
q. Mouth
r. Eye
s. Ear
t. Nose
u. Teeth
v. Brain
w. Pelvis
x. Hip
y. Thigh
z. Knee
aa. Lower leg
bb. Ankle
cc. Foot
dd. Toe
ee. Systemic
ff. Genitalia
hh. Other ________________________

What was the STRUCTURE that was injured?

a. Bone   b. Muscle   c. Ligament   d. Nerve   e. Vascular
f. skin   g. Joint   h. Organ   i. Other ________________

What was the NATURE of the injury?

a. First time this injury occurred
b. Injury developed over time
c. An injury to a previous injury

Identify the TIME the injury occurred.

a. Competition (home) __ Specify: start middle end
b. Competition (away) __ Specify: start middle end
c. Practice (warm-up) __
d. Practice (conditioning) __
e. Practice (skill training) __
f. Practice (cool down) __

What was the MECHANISM of the injury?

a. Direct impact   b. Twist   c. Stretch   d. Overuse
e. Impingement   f. Shearing   g. Infection   h. contact
i. Equipment   j. Environment   k. Fatigue   l. Stretch
m. Other _________________________

What was the WEATHER/SNOW CONDITIONS at the time of the injury?

a. Indoor
b. Outdoor
  Temperature C _____   Sun __   Cloud __

  Light / Visibility   a. Good   b. Moderate   c. Poor   d. Dark
  Snow conditions   a. Ice   b. Wet   c. New (powder)
  Ice conditions   a. Natural   c. Artificial
  Snow / Weather comments______________________________

WHERE was the injury treated?

a. Emergency Room   b. Physician Clinic   c. Hospital   d. On-site
e. Not Treated   f. Self treated   g. Other _______________

WHO was the primary care provider for this injury?

a. Physician b. Physiotherapist c. Athletic Therapist d. Trainer e. Nurse
f. Dentist g. Coach h. Ski Patrol i. Self
j. First Aider k. Other ______________________

Were you referred to a: a. Physician b. Physical Therapist
c. Hospital d. Counsellor
e. Not referred

What was the MEDICAL ATTENTION / TREATMENT that was given?

a. Assessment b. Counselling c. Deep friction d. Education
e. First aid f. Heat g. I.C.E. h. Ice
i. immobilization j. Injection k. Interferential l. Laser
m. Massage n. Mobilization o. Muscle Stim. p. Strengthen
q. Stretching r. Suture s. Taping/Wrap t. TNS
u. Ultrasound v. Wound Care W. Other ________________

Did the injury TREATMENT require any of the following:

a. braces b. cast c. crutch / cane d. orthotics
e. sling f. splint g. surgery h. wheelchair
i. other ______________________

Specify the INJURY _______________________________________
(diagnosis, bone, soft-tissue, illness)

As a result of the injury, were there any modifications in

1. Activity	a. not altered	b. altered	c. total rest
2. Competition	a. not withheld	b. temporarily withheld	c. withheld
3. Practice	a. not withheld	b. temporarily withheld	c. withheld

4. Assistant Devices Specify ________________________________

5. Equipment Specify ____________________________________

Were you wearing any PROTECTIVE EQUIPMENT at the time of the injury?

a. Braces
b. Eye protection
c. Face mask
d. Gloves
e. Helmet
f. Neck protector
g. Protective Boots
h. Shoulder pads
i. Elbow pads
j. Knee pads
k. Tape/Wrap
l. Strapping
m. None worn
n. Other ____________________

PLEASE ANSWER THE FOLLOWING QUESTIONS TO THE BEST OF YOUR ABILITY.

1. HOW MIGHT YOUR INJURY HAVE BEEN PREVENTED?

2. LIST ANY PROBLEMS WITH SECONDARY INJURY:

3. LIST ANY OTHER SPORTS OR ACTIVITY PARTICIPATING IN AT THE TIME OF INJURY?

APPENDIX B

Consent Form

INFORMED CONSENT

The Injury Experience of
Elite Athletes with a Disability in Winter Sport:
An Epidemiological Model

I ....hereby give my consent to be involved in an investigation entitled "The injury experience of elite athletes with a disability in winter sport: an epidemiological model". I understand that the purpose of this study is to identify the types of injuries at the elite level for disabled sport, and to present an injury profile to address the issues and needs.

I understand that the protocol will involve a questionnaire. I understand that the information on the questionnaire will involve a retrospective look at the injuries I have incurred over my sport experience. I understand that the questionnaire must be completed as accurately as possible. The questionnaire will take approximately 45 minutes to complete. I understand that I will be interviewed to complete this questionnaire.

I understand that I am assured of confidentiality and the information on the questionnaire will not affect my participation in the international games.

I understand that during the international games, my medical profile will be reviewed for the purposes of this study only.

I understand that I may withdraw without prejudice to myself at any time without any consequences.

I have had the chance to ask questions about the investigation and have had my questions answered. I will receive a copy of the signed informed consent.

For further questions, I will contact

Joan Matthews or Robert Steadward
at the Rick Hansen Centre
Edmonton, Alberta (403) 492-9238
(403) 492-3182

Signed (subject) ....

Signed (witness) ....

Sign (investigator) ....
Date ....

The Injury Experience of Elite Athletes with a Disability in Winter Sport: An Epidemiological Model

Dear Athlete:

As researchers at the University of Alberta, we are conducting a project examining the frequency and nature of injuries suffered by elite athletes with a disability competing in winter sport events. The results of this project will be used to help identify the types of injuries that occur at this level of sport.

Participation in this project will require about 45 minutes of your time in an interview to complete a short questionnaire.

In addition, during the competition, on-site and clinical staff will complete forms detailing the medical treatment utilized at the medical clinics.

There will be no personal evaluations made and all information given by you will be dealt with in confidence. No individual will be identified in any reports resulting from this project.

On the next page, there are spaces for you to give your name and phone number. Your signature is also required, as a sign of your willingness to participate in this important project. Your participation is voluntary and you may withdraw your consent at any time during the course of the project.

Thank you in advance for your participation and if you have any questions or comments, please phone Joan Matthews (403-492-3182) or Dr. Robert Steadward at the Rick Hansen Centre (403-492-3182).

Sincerely yours,

Dr. R.D. Steadward, PhD　　　　Joan Matthews, M.Sc.

The Injury Experience of
Elite Athletes with a Disability in Winter Sport:
An Epidemiological Model

CONSENT

I have read the information included with this questionnaire and agree to participate in this research project. I understand that all of the answers I will give and future information that I may provide will be confidential and will be used only as group data in research. I have received a copy of the cover letter for my own records and I understand that I may withdraw my participation in this research project at any time I choose.

TEAM ______________________________

NAME (please print) ______________________

PHONE NUMBER _____________

SIGNATURE _______________ DATE ______

WITNESS ________________

PRINCIPAL INVESTIGATOR _____________________

THANK YOU FOR YOUR COOPERATION.

APPENDIX C

Ice Sledge Hockey Athlete Profile

SLEDGE HOCKEY ATHLETE PROFILE

ATHLETE NUMBER: __

DAY/MOS /YEAR
Name _______________ Age ___ Date of Birth __/__/__

Address ________________________________

City/Province ________________

Postal Code _____________

Home Phone Number: __________

Work Phone Number: __________

Are you 1) MALE
2) FEMALE

Minor (17 years or younger)
Please have your parent or guardian complete the following information:

Name of Parent or Guardian_____________________

Address_______________________________

City\Province______________________

Home Phone Number (_)_____

Sledge Hockey Participant Profile

ATHLETE CODE: _____

Please answer the following questions pertaining to your sledge hockey participation during the 1994/95 season

Section I **Circle the best answer(s).**

Were you taking any medication during sledge hockey participation?

1) No 2) Antibiotics 3) Anti-inflammatory
4) Anti-spasticity 5) Other: specify ____________________

Were you taking any type of Nutritional Supplements?

1) No 2) Proteins 3) Vitamins
4) Other: specify ____________________

List the Sport(s) you were participating in during your hockey season:

1) Sledge hockey: Position ______________
2) Other: ________________________

Do you have a disability? 1. NO If no, go to Section 2
2. YES If yes, complete the following section:

What is the date of your Disability? (month/year):____/_____

What was the cause of your disability?

1. Birth (congenital): a. Disease b. Deformity
2. Acquired: a. Accident b. Trauma c. Disease
d. Other __________

What is your disability?

a. Spinal cord injury Level: ___	b. Visually Impaired
c. Spina Bifida	d. Amputee
e. Muscular Dystrophy	f. Cerebral Palsy
g. Multiple Sclerosis	h. Polio
i. Osteoarthritis	j. Congenital deformity
k. Lupus	l. Other _______________

Did you compete in sport prior to your disability?

1. NO
2. YES If yes, list your sport involvement and the number of years
Sport/years: ________________________

Were Pressure Sores a Problem in sledge hockey participation?
1. NO
2. YES: if yes,
What were the problems: ____________________________
Where were the problems: ____________________________

Did you have Stump Problems in participating in sledge hockey?
1. NO
2. YES: if yes,
What were the problems: ____________________________
Where were the problems: ____________________________

Section II Please complete the following section:

What is your point Classification for sledge hockey: ________
What was your level of participation in sledge hockey:
a. JUNIOR b. INTERMEDIATE C. SENIOR

How many years have you:
Participated in sledge hockey? ___ years
Had instructions or coaching? ___ years

What is your highest level of competition?
1. Local \ Regional League 2. National
3. International \ World games 4. Paralympics

Pertaining to your participation in Sledge Hockey, did you have a:

Sledge hockey COACH	1. No	2. Yes	
Was the coach Certified?	1. No	2. Yes	3. Unknown
Personal PHYSICIAN	1. No	2. Yes	
Personal PHYSIOTHERAPIST	1. No	2. Yes	
TRAINER	1. No	2. Yes	
EQUIPMENT MANAGER	1. No	2. Yes	
MASSEUSE	1. No	2. Yes	
PSYCHOLOGIST	1. No	2. Yes	
PARAMEDIC PERSONNEL	1. No	2. Yes	

Section III **Please answer the following questions regarding your past training practices during the 1994/95 season for sledge hockey:**

Indicate the **DAY/MONTH** when you BEGAN and FINISHED your sledge hockey season for 1994/95:

BEGAN: ___/___ FINISHED: ___/___

For Practices:
What was the average number of **days per week** that you spent practicing for sledge hockey in each month for this season? (0 - 7 days)

September ___ October ___ November ___ December ___ January ___
February ___ March ___ April ___

What was the average number of **weeks per month** that you spent practicing for sledge hockey in each month for this season? (0 - 4 weeks)

September ___ October ___ November ___ December ___ January ___
February ___ March ___ April ___

What was the average number of **hours** spent in one sledge hockey **practice session**?
a. 1/2 hour b. 1 hour c. 1.5 hours d. 2 hours e. 2.5 hours

For Games:
What was the average number of **days per week** that you participated in a sledge hockey game in each month for this season? (0 - 7 days)

September ___ October ___ November ___ December ___ January ___
February ___ March ___ April ___

What was the average number of **weeks per month** that you participated in a sledge hockey game in each month for this season? (0 - 4 weeks)

September ___ October ___ November ___ December ___
January ___ February ___ March ___ April ___

What was the average number of **minutes** that you participate in a sledge hockey **game**?

a. less than 20 min b. 20 min c. 40 min d. 60 min

Indicate the number of **DAYS PER WEEK** you participated in the specific training practices for each month: (eg. 0 - 7 days)

	Sept	Oct	Nov	Dec	Jan	Feb	March
1. Strength or Weight Trained	__	__	__	__	__	__	__
2. Aerobic or Distance Trained	__	__	__	__	__	__	__
3. Sprint or Anaerobic Trained	__	__	__	__	__	__	__
4. Flexibility or Stretching	__	__	__	__	__	__	__

Did You Warm-up before each PRACTICE?
1. NO
2. YES

Before each GAME?
1. NO
2. YES

Did You Cool-down after each PRACTICE?
1. NO
2. YES

After each GAME?
1. NO
2. YES

Circle the type of Equipment you used for sledge hockey:

1) SLEDGE (high back)
2) SLEDGE (low back)
3) Knee Pads
4) Padding
5) Straps
6) Back brace
7) Leg brace
8) Hockey Gloves
9) Helmet
10) Full face mask
11) Half face mask
12) Neck Protector
13) Chest protector
14) Shoulder pads
15) Elbow pads
16) Protective boots
17) OTHER ______________________

Did you make any MODIFICATIONS to your sledge or equipment (personal, professional)
1) No
2) Yes: IF YES, specify ______________________________

Has Cold, Hypothermia or Thermal Heat Loss ever been a problem during participation in sledge hockey?
1. NO
2. YES:
If YES, Explain: ________________________________

Circle any problems that have prevented you from participation in sport, and specify on the line below:

a. Medical problems related to the disability b. Lack of equipment
c. Lack of support personnel d. None
e. Other _______________

Specify ____

Have you ever received any information on INJURY PREVENTION?
1. NO 2. YES

Circle the types of sports-related educational programs in which you would like to take part in or receive more information on:
a. weight training b. conditioning c. sport performance
d. sport skills e. nutrition/diet f. motivation
g. prevention h. equipment i. sport psychology
j. none
k. other ____

Do you presently have a medical condition or injury?
1. NO
2. YES, If YES: Is it related to participating in sledge hockey?
1. NO
2.YES
List condition: ________________________

Your contribution to this effort is very greatly appreciated. This project will provide you with an analysis of this injury information to help enhance the quality of your athletic participation.

THANK YOU FOR YOUR TIME AND CO-OPERATION

APPENDIX D

Sledge Hockey Sport Injury / Illness Reporting Form

SLEDGE HOCKEY SPORT INJURY / ILLNESS REPORTING FORM

ATHLETE CODE: ____

COMPLETE THIS FORM IF ANY INJURY OCCURRED DURING THE SLEDGE HOCKEY 1994/95 SEASON. COMPLETE A **NEW FORM FOR EACH INJURY** THAT OCCURRED.

A SPORT INJURY IS DEFINED AS:

ANY TRAUMA THAT OCCURRED DURING ANY PRACTICE OR COMPETITION SESSION WHICH RESULTED IN MEDICAL CARE

OR

RESULTED IN MODIFYING OR STOPPING YOUR PARTICIPATION IN SLEDGE HOCKEY FOR ANY GIVEN LENGTH OF TIME.

CIRCLE THE BEST ANSWERS ON THIS FORM. COMPLETE THE QUESTIONS AS THEY RELATE TO YOUR SPORTS INJURY/ILLNESS. YOU MAY CHOOSE MORE THAN ONE ANSWER IN CERTAIN QUESTIONS.

DATE OF INJURY	DATE OF RETURN TO HOCKEY
__/__/__	__/__/__
day/month/year	day/month/year

What was the **TYPE** of injury?

- a. Abscess
- b. Allergic Reaction
- c. Autonomic Dysreflexia
- d. Infection
- e. Rash
- f. Seizure
- g. Temperature-related problem
- h. Pressure Sore
- i. Blister
- j. Bursitis
- k. Bruise
- l. Head injury (concussion)
- m. Dental injury
- n. Dislocation
- o. Fracture
- p. Laceration (cut)
- q. Muscle Cramp
- r. Spasticity
- s. Sprain (injury to ligament)
- t. Strain (injury to muscle or tendon)
- u. Tendonitis
- v. Unknown
- w. Other ____________________

What was the **Side** of the body of the injury/illness?

a. left b. right c. centre

Where was the **LOCATION** of the injury?

a. Cervical Spine   b. Thoracic Spine   c. Lumbar Spine   d. Sacral Spine
e. Head   f. Face   g. Neck   h. Shoulder
i. Upper arm   j. Elbow   k. Forearm   l. Wrist
m. Hand   n. Finger   o. Chest   p. Abdomen
q. Mouth   r. Eye   s. Ear   t. Nose
u. Teeth   v. Brain   w. Pelvis   x. Hip
y. Thigh   z. Knee   aa. Lower leg   bb. Ankle
cc. Foot   dd. Toe   ee. Systemic   ff. Genitalia
hh. Other ______________________________

What was the **STRUCTURE** that was injured?
a. Bone   b. Muscle   c. Ligament   d. Tendon
e. Vascular   f. Skin   g. Joint   h. Organ
i. Nerve   j. Other __________________

What was the **NATURE** of the injury?
a. First time this injury occurred
b. Injury developed over time
c. An injury to a previous injury

Identify the **TIME** the injury occurred:
a. Competition / Game   Specify: i. start   ii. middle   iii. end
b. Practice
c. Conditioning
d. Training
e. Other _____________________________

How did this injury occur?
a. Contact   b. Fall
c. Non-contact   d. Stretch
e. Equipment failure   e. Other ___________________________

Why did this injury occur?
a. Overuse   b. Fatigue
c. Equipment failure   d. Surface condition
e. Impingement   f. Stretched
g. Twisted   h. Other ___________________________

What were the **CONDITIONS** at the time of the injury?

a. Indoor i. Good ii. Poor iii. Dark
b. Outdoor Temperature°C:___ i. Sunny ii. Cloudy

As a result of the injury/illness, indicate if there were any modifications in:

1. Daily Activity	a. total rest	b. limited	c. none
2. Competition	a. stopped	b. modified	c. none
3. Practice	a. stopped	b. modified	c. none
4. Equipment	a. altered	b. not altered	

Specify ______________________________

Were you wearing any **PROTECTIVE EQUIPMENT at the** **site** of the injury?

1. NO
2. YES, **if YES**: Circle the equipment at the injured site

a. Braces
b. Eye protection
c. Face mask
d. Gloves
e. Helmet
f. Neck protector
g. Chest protector
h. Shoulder pads
i. Elbow pads
j. Knee pads
k. Protective Boots
l. Strapping
m. Tape/wrap
n. None worn
o. Other ____

Was the injury **EVALUATED or ASSESSED**?

a. NO If NO, go to the last page
b. YES If YES, Complete the section below

WHERE was the injury treated?

a. Emergency Room
b. Physician Clinic
c. Hospital
d. On-site
e. Not Treated
f. Self treated
g. Other ____________

WHO was the primary care giver?

a. Physician
b. Physiotherapist
c. Athletic Therapist
d. Trainer
e. Nurse
f. Dentist
g. Coach
h. Referee
i. Self
j. Volunteer
k. Other ________________

WHAT medical treatment was given?

a. surgery
b. immobilized
c. ice/heat
d. stretching
e. wound care
f. suture
g. cast
h. tape/wrap/bandage
i. special padding
j. medication
k. none
l. other ______________________

List the specific INJURY/ILLNESS **DIAGNOSIS:** ______________

PLEASE ANSWER THE FOLLOWING QUESTIONS TO THE BEST OF YOUR ABILITY.

1. Describe how your injury occurred?

____

____

2. How might your injury have been prevented?

____

____

3. List any problems with this injury as it relates to your disability (if applicable):

____

____

4. List any other sports or activity participating in at the time of the injury?

____

____

APPENDIX E

Consent Form

INFORMED CONSENT

A Retrospective Study of Athletes Participating in Sledge Hockey

This consent form, a copy of which will be given to me, gives my informed consent to be involved in a project entitled "A retrospective study of athletes participating in sledge hockey". I understand that **the purpose of this study is to collect information to form a more complete profile of a Canadian sledge hockey athlete. It will also form a basis for injury and illness prevention**.

I understand that the project will involve completing **a profile form, and a sport injury/illness form** if any injuries occurred during my season. I understand that I must complete the forms as accurately as possible. The forms will take approximately 20 minutes to complete. I understand that I will be responsible to return these forms in the enclosed pre-paid envelope.

I understand that I am assured of confidentiality and the information on the forms will not affect my participation in my sport. Release of any information for research purposes and giving feedback to me or the Canadian Sledge Hockey Assocation will not identify me by name.

I understand that I am free to withdraw from this project without prejudice to myself and without any consequences.

I have had the chance to ask questions about the project and have had my questions answered. I agree to participate in this project. If I have any questions during the project, I will ask for clarification.

If I have any further questions or concerns regarding this project, I may contact
Joan Matthews, The Rick Hansen Centre, Edmonton, Alberta
(403) 492-7158.

Name of Athlete	Signature of Athlete
Name of Witness	Signature of Witness
Date	

ATHLETE'S COPY **INFORMED CONSENT** **ATHLETE'S COPY**

A Retrospective Study of Athletes Participating in Sledge Hockey

This consent form, a copy of which will be given to me, gives my informed consent to be involved in a project entitled "A retrospective study of athletes participating in sledge hockey".

I understand that **the purpose of this study is to collect information to form a more complete profile of a Canadian sledge hockey athlete. It will also form a basis for injury and illness prevention**.

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I understand that I am assured of confidentiality and the information on the forms will not affect my participation in my sport. Release of any information for research purposes and giving feedback to me or the Canadian Sledge Hockey Assocation will not identify me by name.

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I have had the chance to ask questions about the project and have had my questions answered. I agree to participate in this project. If I have any questions during the project, I will ask for clarification.

If I have any further questions or concerns regarding this project, I may contact
Joan Matthews, The Rick Hansen Centre, Edmonton, Alberta
(403) 492-7158.

APPENDIX F

Wheelchair Basketball Athlete Profile

WHEELCHAIR BASKETBALL ATHLETE PROFILE

ATHLETE CODE: __

Day/Mos/Year
Name ________________ Age ___ Date of Birth __/__/__

Address _________________________________

____

City/Province ________________

Home Phone Number: _______

Work Phone Number: _______

Minor (17 years or younger)
Please have your parent or guardian complete the following information:

Name of Parent or Guardian______________________
Address________________________________
City\Province______________________
Home Phone Number (__)_____

Your contribution to this effort is very greatly appreciated. This project will provide you with an analysis of this injury information to help enhance the quality of your athletic participation.

THANK YOU FOR YOUR TIME AND COOPERATION

WHEELCHAIR BASKETBALL ATHLETE PROFILE

ATHLETE CODE: _____

I **Please answer the following questions pertaining to wheelchair basketball. Circle the appropriate answer(s).**

Are you taking any type of medication?

1) NONE 2) ANTIBIOTICS 3) ANTIINFLAMMATORY
4) ANTISPASTICITY 5) OTHER: specify ______________________

Are you taking any type of Nutritional Supplements?

1) NONE 2) PROTEINS 3) VITAMINS 4) OTHER: specify _______

List the Sport(s) you are currently participating in:

1) WHEELCHAIR BASKETBALL: Position ______________

2) Other: _________________________

Do you have a disability? a. NO b. YES

If no, go to Section II:
If yes, Answer the following questions:

What is the date of your Disability? (month/year): ____/_____

Cause of Disability?
1. Birth (congenital): a. disease b. deformity
2. Aquired: a. accident b. trauma c. disease d. other ___

Specific disability?
a. Spinal cord injury Level:____ b. Visually Impaired c. Spina Bifida
d. Amputee e. Lupus f. Cerebral Palsy
g. Multiple Sclerosis h. Polio i. Osteoarthritis
j. Congenital deformity k. Muscular Dystrophy
l. Other _________________

Did you compete in sport prior to disability?
1. NO
2. YES:

If YES, list your sport involvement and the number of years involved:

sport: ______________ years: __
sport: ______________ years: __

Do you use a PROSTHETIC DEVICE for wheelchair basketball participation?
1. NOT APPLICABLE
2. NO
3. YES: If YES, LIST

Are Pressure Sores a Problem or concern in wheelchair basketball participation?
1. NOT APPLICABLE
2. NO
3. YES: what are the problems: ____________________________
where are the problems: ____________________________

Are Stump-related concerns a Problem for wheelchair basketball participation?
1. NOT APPLICABLE
2. NO
3. YES: what are the problems: ____________________________

where are the problems: ____________________________

II Please complete the following section:

What is your point Classification for wheelchair basketball (eg. .5): _________

How many years have you:

Participated in wheelchair basketball?	___ years
Had lessons, coaching or instruction in wheelchair basketball?	___ years

What is your highest level of team participation in wheelchair basketball?

1. Local \ League	2. National
3. International \ World Games	4. Paralympics

Pertaining to your participation in the CWBL, Does your team have a:

Basketball COACH	1. No	2. Yes
Is the coach NCCP certified?	1. No	2. Yes, what level: _
Does your coach directly supervise your practice, game or training sessions for wheelchair basketball?	1. No	2. Yes
PHYSICIAN	1. No	2. Yes
PHYSIOTHERAPIST/TRAINER	1. No	2. Yes
EQUIPMENT MANAGER	1. No	2. Yes
PARAMEDIC PERSONNEL	1. No	2. Yes
MASSEUSE	1. No	2. Yes
PSYCHOLOGIST	1. No	2. Yes

III Please answer the following Questions regarding your present training practices for wheelchair basketball:

During the past 30 days, how many **times per week** did you practice wheelchair basketball?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

During the past 30 days, what was the **average time of your practice session**?
1) 0-1\2 hour 2) 1\2 hour - 1 hour 3) 1-1.5 hours
4) 1.5-2 hours 5) 2-2.5 hours 6) 2.5 hours or more hours

During the past 30 days, how many **times per week** did you participate in a wheelchair basketball game?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

During the past 30 days, what was the **average time of your participation** in the game?
1) 0-1\2 hour 2) 1\2 hour - 1 hour 3) 1-1.5 hours
4) 1.5-2 hours 5) 2-2.5 hours 6) 2.5 hours or more hours

During the past 30 days, how many **times per week** did you strength or weight train for wheelchair basketball?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

During the past 30 days, how many **times per week** did you distance, endurance or aerobic train for wheelchair basketball?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

During the past 30 days, how many **times per week** did you train by sprinting for wheelchair basketball?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

During the past 30 days, how many **times per week** did you train by stretching?
0) none 1) 1 2) 2 3) 3 4) 4 5) 5 6) 6 7) 7

Do You Warm-up before each PRACTICE?
1. NO 2. YES

Do you warm-up before each GAME?
1. NO 2. YES

Do You Cool-down after PRACTICE?
1. NO 2. YES

Do you Cool-down after GAMES?
1. NO 2. YES

Circle the type of Equipment that you use for wheelchair basketball participation:
1) high back wheelchair 2) low back wheelchair 3) gloves
4) padding / foam 5) straps 6) leg braces
7) back brace 8) elbow pads 9) tape / wraps
10) eye protection 11) OTHER ______________________

Have you made any MODIFICATIONS to your EQUIPMENT (personal, professional)
1) NO
2) YES, specify:________________________________

____

Circle any problems that have ever prevented you from participation in wheelchair basketball, and explain on the line below:
a. Medical problems related to your disability b. Lack of equipment
c. Lack of support personnel d. None
e. Other _____________

Explain (specify): ______________________________________

Have you ever received any information on INJURY PREVENTION or TREATMENT?
1. NO 2. YES

Circle the types of sports-related educational programs in which you would like to take part in or receive more information on:
a. weight training b. conditioning c. sport performance d. sport skills
e. nutrition / diet f. motivation g. sport psychology h. equipment
i. injury prevention j. none
k. other ___________________

Do you presently have an injury or disability related illness?
1. NO
2. YES, IF YES: Is the condition related to participating in wheelchair basketball?
1. NO
2. YES, List the condition: _________________

____

THANK YOU FOR YOUR TIME AND COOPERATION

APPENDIX G

Consent form

INFORMED CONSENT

A Prospective Study of Athletes Participating in Wheelchair Basketball

This consent form, of which I have a copy, gives my informed consent to be involved in a project entitled "A prospective study of athletes participating in wheelchair basketball". I understand that **the purpose of this study is to collect information to form a more complete medical record for me as an athlete.** It will also form a basis for injury and illness prevention, and in the development of a specific monitoring process.

I understand that the project will initially involve completing an athlete profile form, followed by a sport injury/illness form in the event of an injury and a bi-weekly participation form. I understand that the forms must be completed as accurately as possible. The initial form will take approximately 15 minutes to complete, and the weekly form will take approximately 5 minutes once per week to complete. I understand that I will be responsible to return these forms in a pre-paid envelope twice per month until the end of our season in the Women's Conference of the CWBL. I understand that there will not be any commitment of time outside of the normal medical monitoring process.

I understand that I am assured of confidentiality and the information on the forms will not affect my participation in my sport. Release of any information for research purposes and giving feedback to me or the Canadian Wheelchair Basketball Association will not identify me by name.

I understand that I am free to withdraw from this project without prejudice to myself at any time and without any consequences.

I agree to participate in this study. If I have any questions during the project, I will ask for clarification or new information thoughout my participation.

If I have any further questions or concerns regarding this project, I may contact Joan Matthews or Bob Steadward at the Rick Hansen Centre, Edmonton, Alberta at (403) 492-7158 or (403) 492-3182, or Reg McClellan, CWBA National Office, Ottawa at (613) 748-5888.

__________________	__________________
Name of Athlete	Signature of Athlete
__________________	__________________
Name of Witness	Signature of Witness

____

Date

ATHLETE'S COPY **INFORMED CONSENT** **ATHLETE'S COPY**

A Prospective Study of Athletes Participating in Wheelchair Basketball

This consent form, of which I have a copy, gives my informed consent to be involved in a project entitled "A prospective study of athletes participating in wheelchair basketball". I understand that **the purpose of this study is to collect information to form a more complete medical record for me as an athlete.** It will also form a basis for injury and illness prevention, and in the development of a specific monitoring process.

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If I have any further questions or concerns regarding this project, I may contact Joan Matthews or Bob Steadward at the Rick Hansen Centre, Edmonton, Alberta at (403) 492-7158 or (403) 492-3182, or Reg McClellan, CWBA National Office, Ottawa at (613) 748-5888.

____________________ Name of Athlete	____________________ Signature of Athlete
____________________ Name of Witness	____________________ Signature of Witness
____________________ Date	**ATHLETE'S COPY**

APPENDIX H

Wheelchair Basketball Calendar

WHEELCHAIR BASKETBALL CALENDAR

ATHLETE CODE: ___ MONDAY _/ /_ TO SUNDAY _/ /_

(every 2 weeks)

DATE OF SESSION	SESSION*	LENGTH OF SESSION (MINUTES)	PARTICIPATION

SESSION*
1. PRACTICE
2. GAME
3. SCRIMMAGE
4. CONDITIONING
5. WEIGHT LIFTING
6. OTHER ___________

PARTICIPATION
1. FULL
2. PARTIAL
3. NONE

DID YOU HAVE AN INJURY THIS WEEK THAT CAUSED YOU TO MODIFY, MISS, OR INTERRUPT A SCHEDULED PRACTICE OR COMPETITION?

1) NO 2) YES

COMMENTS ____

APPENDIX I

Wheelchair Basketball Injury/Illness Reporting Form

WHEELCHAIR BASKETBALL INJURY/ILLNESS REPORTING FORM

Athlete Code: __________

DATE OF INJURY _/_/_

DATE OF PARTIAL RETURN _/_/_

DATE OF FULL RETURN _/_/_

SESSION
01 REGULAR PRACTICE
02 GAME
03 SCRIMMAGE
04 CONDITIONING\TRAINING
05 OTHER ________

DISPOSITION
1. RETURN TO PLAY
2. STOP PARTICIPATION

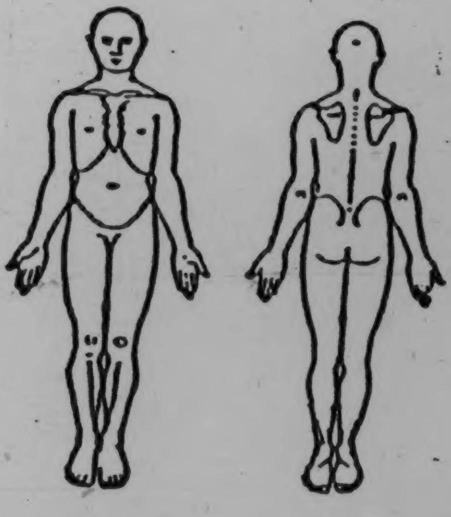
SIDE
01 RIGHT
02 LEFT
03 BOTH
04 CENTRE

HOW DID THIS INJURY OCCUR
01 CONTACT
02 FALL
03 EQUIPMENT
04 OVERUSE
05 STRETCH
06 FATIGUE
07 EQUIPMENT FAILURE

SURFACE
01 WOOD FLOOR
02 RUBBER FLOOR
03 ROAD SURFACE
04 TRACK

SURFACE CONDITION
01 Indoor
02 Outdoor

TYPE OF INJURY
01 BRUISE
02 BLISTER
03 SPRAIN (injury to ligament)
04 STRAIN (injury to muscle or tendon)
05 FRACTURE
06 DISLOCATION\SUBLUXATION
07 CONCUSSION (head injury)
08 DENTAL INJURY
09 WOUND
10 ILLNESS\SICKNESS (cold\flu\infection)
11 SEIZURE
13 ALLERGIC REACTION
13 AUTONOMIC DYSREFLEXIA
14 TEMPERATURE RELATED PROBLEM
15 PRESSURE SORE
16 SPASTICITY
17 OTHER_____________
18 UNKOWN



BODY PART:
PLACE A "X" ON THE INJURED AREA

MEDICALLY EVALUATED
01 YES
02 NO

FIRST AID

01 SURGERY
02 IMMOBILIZATION
03 ICE\HEAT
04 WOULD CARE
05 SUTURE
06 CAST
07 SPECIAL PADDING
08 TAPE\WRAP\BANDAGE
09 MEDICATION
10 NONE

WHERE WAS INJURY TREATED

01 EMERGENCY ROOM
02 PHYSICIAN OFFICE\CLINIC
03 HOSPITAL (stay or admitted)
04 SITE (practice\competition)
05 OTHER__________
06 NOT TREATED
07 SELF TREATED

PRIMARY CARE GIVER

01 Physician
02 Therapist
03 Trainer
04 Paramedic
05 Coach
06 Self
07 None

SUPPORTIVE EQUIPMENT FAILURE

01 WHEEL
02 RIM\TIRE
03 PROSTHETICS
04 WHEELCHAIR
05 OTHER
06 NONE INVOLVED

PROTECTIVE EQUIPMENT AT SITE OF INJURY

01 BRACES (leg\arm\back)
02 EYE PROTECTION
03 TAPE/WRAP
04 GLOVES
05 STRAPPING
06 ELBOW PADS
07 PROTECTIVE BOOTS
08 OTHER ____________
09 NONE WORN

ACTION TAKEN

01 No Follow-up
02 REFERRED FOR THERAPY
03 REFERRED FOR MEDICAL
04 SELF TREATED

DESCRIBE HOW YOUR INJURY OCCURRED:____________________________

____

____

APPENDIX J

Consent Form

INFORMED CONSENT

MEDICAL CARE
FOR THE ATHLETE WITH A PHYSICAL DISABILITY

This consent form, a copy of which will be given to me, gives my informed consent to be involved in a project entitled "Medical care for the athlete with a physical disability". I understand that **the purpose of this study is to collect information on the medical support for athletes who participate in disability sport, the interaction with the health care system.**

I understand that the project will involve completing **an interview** about my sports medicine experiences in disability sport. I understand that the interview may take approximately 20 minutes to complete.

I understand that I am assured of confidentiality, and the information from the interview will not affect my sport participation. Release of any information for research purposes or specific sport feedback will not identify me by name.

I understand that I am free to withdraw from this project without prejudice to myself and without any consequences.

I have had the chance to ask questions about the project and have had my questions answered. I agree to participate in this project. If I have any questions during the project, I will ask for clarification, and I may contact
Joan Matthews at The Rick Hansen Centre in Edmonton at (403) 492-7158.

____________________	____________________
Name of Athlete	Signature of Athlete
____________________	____________________
Name of Witness	Signature of Witness
____________________	
Date	

ATHLETE'S COPY

INFORMED CONSENT

MEDICAL CARE
FOR THE ATHLETE WITH A PHYSICAL DISABILITY

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I have had the chance to ask questions about the project and have had my questions answered. I agree to participate in this project. If I have any questions during the project, I will ask for clarification, and I may contact

Joan Matthews at The Rick Hansen Centre in Edmonton at (403) 492-7158.

__________________	__________________
Name of Athlete	Signature of Athlete
__________________	__________________
Name of Witness	Signature of Witness
__________________	
Date	

APPENDIX K

Interview Question Framework

Sports Medical Care and the Female Athlete

Interview Question Framework

1. Tell me about your injury.
2. What does it mean to you to be a healthy athlete? How do you maintain your health?
3. What happens when you are injured? What do you do?
4. If you were self-treating, how did you learn to treat your injury? How do you know what it is? How does it affect your participation?
5. Do you use the medical care system for musculo-skeletal injuries and disability-related injuries?
6. Who do you seek injury information from? Injury treatment or rehabilitation? Do you seek sport injury prevention information?
7. Why would you visit a medical professional?
8. How do you access the medical care system? With whom? Where? What are some things that prevent you from accessing health services?
9. Do you know who or what is available to you?
10. What advice would you give to the medical professionals or sport organization concerning medical care for an individual like yourself?

APPENDIX L

Qualitative Analysis Using WordPerfect 5.1

The coding and sorting of interview data is actually quite straightforward. This is a guide to using WordPerfect to do what is basically electronic cut and paste.

1 1. Widen the margins on the left hand side of the transcript (approx 3 or 4
2 inches will do).
3 2. Number your lines: Shift F8,1,5.
4 3. Print off a copy of the transcript.
5 4. Go through and code the data. The wide margins provide plenty of room
6 for scribbling. The easiest way to do this is to take each paragraph at a
7 time and create a code that you feel the content describes. Do not worry
8 about creating too many codes. When you name a code, create a six or
9 seven letter word that is not a standard dictionary term, but can be
10 recognised easily. Abbreviations are useful in this instance eg: Single sex
11 organization becomes SSORG; personal politics becomes PPOLIT....

The next stage is to get back on the computer. All you are going to do is some electronic cutting and pasting. The task is to append the coded sections to different files, i.e., all the pieces of text that relate to SSORG are listed in a file that is given that name. The beauty of this system is that you do not have to create a file prior to appending. The command that you use will create the file as you go, so to speak.

What you need to do is devise a system that allows you to know immediately from which interview, and where in the transcript the text has come (the appended document does not show the line numbering). So, go through the transcript on the computer, and place the code, the line number and the participant identification code (I used letters) in the wide margin. It should end up looking something like this:

A5CDING 4. Go through and code the data. The wide margins provide plenty of room
for scribbling. The easiest way to do this is to take each paragraph at a
time and create a code that you feel the content describes. Do not worry
about creating too many codes. When you name a code, create a six or
seven letter word that is not a standard dictionary term, but can be
A11ABBRV recognized easily. Abbreviations are useful in this instance eg: Single sex
organization becomes SSORG; personal politics becomes PPOLIT....

Once you have done this, to append a section of coded data to a file, first block off the particular section (F12) making sure you include the code and identification, then using Ctrl-F4,1,4, the blocked text will be appended to the file you select.

When you are appending to the various files, it is worth doing this on the hard drive because not only is it quicker, but it also means you don't have to worry about which disks you are using, how full they are and so on. You can save onto back up discs once you have completed coding each transcript.